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U.S. Department of the Interior
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MINERALS YEARBOOK

Area Reports: International 2004

Africa and the Middle East

Volume III

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U.S. Geological Survey

MINERALS YEARBOOK

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Africa and the Middle East

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U.S. DEPARTMENT OF THE INTERIOR
DIRK KEMPTHORNE, Secretary

U.S. GEOLOGICAL SURVEY
P. PATRICK LEAHY, Acting Director

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industries during 2004 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

P. Patrick Leahy, Acting Director

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Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the World Wide Web at URL http://www.usgs.gov or by contacting the Earth Science Information Center at 1-888-ASK-USGS. For specific information about this publication, contact the Chief, International Minerals Section, Minerals Information Team, at (703) 648-7732, or the Team secretary at (703) 648-4961. Additional minerals information may be accessed on the World Wide Web at URL http://minerals.usgs.gov/minerals.

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Acknowledgments

The Country Specialists in the Minerals Information Team, U.S. Geological Survey, in preparing the International Review regional books of volume III of the Minerals Yearbook, extensively use statistics and data on mineral production, consumption, and trade provided by various foreign Government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations are gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, United Nations publications, and the domestic and foreign technical and trade press. Of particular assistance were reports submitted by the Resource Reporting Officers and other officers of the Department of State in U.S. Embassies worldwide. Their contributions are sincerely appreciated. Internal statistical support was provided by the staff of the Data Collection and Coordination Section of the Minerals Information Team.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

John H. DeYoung, Jr.
Chief Scientist, Minerals Information Team

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The Mineral Industries of Africa

By Thomas R. Yager, Philip M. Mobbs, Omayra Bermúdez-Lugo, George J. Coakley, and David R. Wilburn

The 55 independent nations and other territories of continental Africa and adjacent islands covered in this volume encompass a land area of 30.6 million square kilometers, which is more than three times the size of the United States, and were home to 868 million people in 2004. For many of these countries, mineral exploration and production constitute significant parts of their economies and remain keys to future economic growth. Africa is richly endowed with mineral reserves and ranks first or second in quantity of world reserves of bauxite, cobalt, diamond, phosphate rock, platinum-group metals (PGM), vermiculite, and zirconium.

The mineral industry was an important source of export earnings for many African nations in 2004. To promote exports, groups of African countries formed numerous trade blocs, which included the Common Market for Eastern and Southern Africa, the Economic and Monetary Community of Central Africa, the Economic Community of Central African States, the Economic Community of the Great Lakes Countries, the Economic Community of West African States, the Mano River Union, the Southern African Development Community, and the West African Economic and Monetary Union. Algeria, Libya, and Nigeria were members of the Organization of the Petroleum Exporting Countries (OPEC). The African Union was formally launched as a successor to the Organization of African Unity in 2002 to accelerate socioeconomic integration and promote peace, security, and stability on the continent.

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For mineral production statistics—

- Algeria—Ministry of Energy and Mines,
- Botswana—Department of Mines,
- Burundi—Ministry of Energy and Mines,
- Côte d'Ivoire—National Corporation of Petroleum Operations,
- Egypt—Ministry of Petroleum,
- Eritrea—Department of Mines,
- Ethiopia—Ministry of Mines and Energy,
- Gambia, The—Geology Department,
- Ghana—Minerals Commission,
- Guinea—Ministry of Mines and Geology,
- Kenya—Ministry of Environment, Natural Resources, and Wildlife,
- Lesotho—Department of Mines and Geology,
- Malawi—Department of Mines,
- Mauritius—Ministry of Agriculture, Food Technology, and Natural Resources,
- Morocco—Ministry of Energy and Mines,
- Mozambique—National Directorate of Mines,
- Namibia—Ministry of Mines and Energy,
- Senegal—Ministry of Mines, Energy, and Water,
- Seychelles—Ministry of Economic Planning,
- Sierra Leone—Director of Mines,
- South Africa—Department of Minerals and Energy, Mineral Economics Directorate,
- Tanzania—Ministry of Energy and Minerals, and
- Zimbabwe—Chamber of Mines.

For basic economic data—the International Monetary Fund in the United States.

For mineral consumption data—

- British Petroleum plc,
- Department of Minerals and Energy of the Republic of South Africa,
- MEPS (International) Ltd., and
- U.S. Department of Energy in the United States.

For exploration and other mineral-related information—the Metals Economics Group (MEG) in Canada.

General Economic Conditions

In 2004, the real gross domestic product (GDP) of Africa grew by 5.3% after increasing by 4.6% in 2003. From 1999 to 2004, Africa's GDP grew at an average annual rate of about 4.2%. In 2004, Equatorial Guinea and Chad achieved the most rapid economic growth in Africa with GDP increases of 14.7% and 10.7%, respectively. Higher production of crude petroleum and natural gas was a major factor in the performance of the economies of Angola, Chad, and Equatorial Guinea. In 2004, the GDP increased by an average of 7.5% in African petroleum-exporting countries and by an average of 4.6% in African petroleum-importing countries. GDP growth in African petroleum-exporting countries was projected to be at or about 5.1% in 2005 and 7.8% in 2006. In petroleum-importing countries, GDP growth was expected to increase to 4.3% in 2005 and 5.2% in 2006 (International Monetary Fund, 2005b, p. 49, 212).

Investment Data and Political Risk

The Department of Minerals and Energy of the Republic of South Africa reported that investment in newly committed mineral-related projects (that is, projects in which funds have already been committed or are being expended) in South Africa was $9.37 billion in 2004. PGM accounted for 57% of the newly committed investment; gold, 24%; other primary minerals, 12%; and processed minerals, 7%. An additional $8.33 billion was reported for potential mineral-related projects (that is, feasibility-level projects for which funds have not yet

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been committed) in South Africa. Gold accounted for 55% of the potential mineral projects; PGM, 37%, and other primary minerals, 8% (Mwape and others, 2005, p. 21).

By 2008, capital expenditures on heavy mineral sands projects were expected to be $840 million at Corridor Sands and Moma in Mozambique, $120 million at Kwale in Kenya, and $70 million at Imperri Hills in Sierra Leone. By 2009, capital expenditures for bauxite and alumina in Guinea were likely to be more than $2.35 billion; nickel in Madagascar, $2.25 billion; and coal in Mozambique, $1 billion. Substantial capital expenditures were also likely for aluminum in Mozambique and South Africa, copper in Congo (Kinshasa) and Zambia, crude petroleum in Nigeria and Sudan, iron ore in Mauritania and Senegal, and natural gas in Nigeria.

Countries directly affected by wars, internal ethnic or political conflicts, and refugee displacements in 2004 included Angola, Burundi, Chad, Congo (Kinshasa), Cote d'Ivoire, Nigeria, Somalia, Sudan, and Uganda. In December 2004, the Government of Sudan signed a permanent cease-fire with the Sudanese People's Liberation Army. Political instability in Burundi led to a reimposition of force majeure at the Musongati nickel deposit in August. The control of gold and tin mines reportedly played an important role in conflicts in eastern Congo (Kinshasa) (Global Witness, 2005, p. 8, 16; Human Rights Watch, 2005, p. 94-96).

Legislation

All mineral exploration in Eritrea was suspended between September 2004 and January 2005. Although no formal justification was announced, the suspension period was most likely imposed to enable review of all aspects of mining law in Eritrea (Mining Journal, 2005). A new mining code was implemented in Senegal in 2004 to define fiscal and legal responsibilities and to provide tax incentives for mining concessions (Mining Journal, 2004a).

During 2002 and 2003, the Government of South Africa put forward new mineral rights legislation and an empowerment charter. The Mineral and Petroleum Resources Development Act, which came into effect in May 2004 (with a 1-year transition period that will end in May 2005), is the principal legislative instrument for implementing the social and economic reforms envisaged by the charter. The Act changes the regulation of access to and ownership of mineral resources in South Africa. It establishes a means of converting existing mining and prospecting rights (old order) and establishing new rights (new order) and sets up a scorecard approach to achieving the mining charter objectives (Mining Journal, 2004b; Rio Tinto plc, 2004§[1]). Accompanying legislation related to royalty and beneficiation issues was due out in early 2005.

Exploration

Exploration activity, as defined by African exploration budgets reported by Metals Economics Group (MEG), increased to $572 million in 2004 from $374 million in 2003 (Metals Economics Group, 2004b). The Africa exploration budget share, however, decreased to 16.1% of the world exploration budget in 2004 from 17.1% in 2003. In 2004, the principal mineral targets in Africa were diamond, gold, and PGM (Metals Economics Group, 2004a). Diamond exploration was conducted mainly in Botswana, Namibia, and South Africa. Gold exploration was conducted mainly in the Birimian Shield of Burkina Faso, Ghana, and Mali; the Kaapvaal Craton of South Africa and Zimbabwe; and the Tanzanian Craton. PGM exploration continued in South Africa, particularly on the Platreef section of the Bushveld Complex. Gold and base metals continued to be explored for in central Africa, primarily in Congo (Kinshasa) and Zambia. Interest in minerals exploration in Madagascar was also renewed.

A recent study released by the Department of Minerals and Energy of the Republic of South Africa reported that although mineral exploration expenditures had increased since 2002, South Africa had lost some of its ability to attract new exploration dollars owing to increased interest in minerals exploration in Australia and Canada (Mwape and others, 2004, p. 8). Part of this loss is a reflection of the relative strength of the South African rand, which raises the cost of conducting business in South Africa. This has resulted in South African mining companies seeking opportunities outside of South Africa. At the same time, changing South African mineral rights legislation made it easier for new participants to enter the exploration business.

African countries that experienced the highest levels of exploration activity in 2004 were, in descending order based on the number of exploration sites included in this annual review, South Africa, Ghana, Mali, Tanzania, Burkina Faso, Congo (Kinshasa), Zambia, Namibia, and Botswana. Gold accounted for approximately 54% of reported African exploration projects; diamond, 14%; PGM, 11%; and base metals, 10%. Early-stage projects accounted for about 79% of the 2004 activity, and feasibility-stage projects, about 11%.

Two World Bank mining sector projects in Africa were financed in 2004. The $120 million Private Sector Development and Competitiveness Project in Congo (Kinshasa) and the $25 million Sustainable Management of Mineral Resources Project in Uganda have the potential to affect mineral exploration in these countries positively (World Bank Group, 2004§).

Commodity Overview

Estimates for production of major mineral commodities for 2007 and beyond have been based upon supply-side assumptions, such as announced plans for increased production/new capacity construction and bankable feasibility studies. The outlook tables in this summary chapter show historic and projected production trends; therefore, no indication is made about whether the data are estimated or reported and revisions are not identified. Data on individual mineral commodities in tables in the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current (2004) producing facilities and on planned new facilities that operating companies, consortia, or Governments

[1]References that include a section mark (§) are found in the Internet References Cited section.

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have projected to come online within indicated timeframes. Forward-looking information, which includes estimates of future production, exploration and mine development, cost of capital projects, and timing of the start of operations, are subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes. Projects listed in the following section are presented as an indication of industry plans and are not a USGS prediction of what will occur.

Metals

Africa's share of world base-metals production and consumption was modest. Mine production of bauxite, copper, gold, and lead was less than that of 1990. Africa produced more than one-fourth of the world's manganese mine output and nearly one-fifth of the world's refined cobalt. South Africa was the world's leading producer of chromite and ferrochromium, gold, manganese ore, palladium, platinum, and vanadium and the world's second ranked producer of manganese and ferromanganese, rutile, and zircon.

The low level of consumption was the result of Africa's low level of industrialization. In 2004, Africa was a net exporter of aluminum, copper, iron ore, nickel, and zinc; it was also a net exporter of iron ore. Africa's share of world steel consumption was about 2%. Within Africa, South Africa was the leading consumer of base metals and steel.

Aluminum and Bauxite and Alumina.—*Production.*—African production of refined aluminum rose by 19% compared with that of 2003. In Mozambique, 2004 was the first year of full production for the Mozal 2 smelter, which was completed in 2003. South Africa's production increased because of the expansion of the Hillside smelter. Output also increased in Cameroon and Egypt. South Africa accounted for about 50% of African aluminum output; Mozambique, 32%; and Egypt, 13% (table 6). Kenya was the only African producer of secondary refined aluminum. Africa accounted for nearly 5% of the world's aluminum production in 2004 (table 4).

African bauxite production remained nearly unchanged in 2004 at 15.5 million metric tons (Mt). From 1990 to 2004, Africa's share of world bauxite production fell to less than 11% from 16%. Guinea accounted for about 97% of African bauxite production; Ghana accounted for most of the remainder (table 5). In 2004, Guinea was the only African producer of alumina; its output was 770,000 metric tons (t), or 1% of world alumina production.

Consumption.—In 2004, world aluminum consumption amounted to 29.5 Mt compared with 27.3 Mt in 2003. African consumption of aluminum fell by nearly 3% to 345,000 t in 2004. South Africa accounted for most of Africa's aluminum consumption (Themba, 2005a).

Outlook.—The production of refined aluminum is expected to rise by an average of nearly 7% per year from 2004 to 2011. The Coega smelter in South Africa and the Mozal 3 smelter in Mozambique are expected to open in 2008 and 2009, respectively. If privatization goes forward, Aluminum Smelter Co. of Nigeria Ltd. could reopen its smelter at Ikot Abasi by 2009 and reach full capacity by 2011 (table 6; Alcan Inc., 2004; Hill, 2006).

African bauxite production could increase to 27.5 Mt by 2009 (table 5). In Guinea, planned increases in alumina refining capacity of about 5 million metric tons per year are expected to lead to higher bauxite production. The Kamsar and the Sangarédi refineries are likely to be completed in 2008, and the expansion of the Friguia refinery could be completed in 2009.

Copper.—*Production.*—In 2004, Africa's mine production increased by 11% from 2003 and 40% from 2000. Zambia was the leading producer in Africa; the country's copper mine production rose by nearly 23% in 2004. The production increase in Congo (Kinshasa) was mostly attributable to rising output from Bwana Mkubwa. Output fell in South Africa because of the closure of the Maranda Mine. In 2004, Zambia accounted for 65% of African copper mine production; South Africa, 16%; and Congo (Kinshasa), 11% (table 7). Africa's share of world copper mine output fell to less than 5% in 2004 from 14% in 1990.

Africa's refined copper production rose by nearly 6% from 2003 to 2004; increasing production from Zambia more than offset lower South African production. In South Africa, production declined because of lower output from the Palabora refinery. In 2004, Zambia accounted for 78% of African refined copper production; South Africa, 18%; and Egypt, 3%. Congo (Kinshasa), which accounted for 37% of continental refined copper output in 1990, had ceased production by 2000 (table 8). Egypt was the only producer of secondary refined copper; primary production accounted for most African production.

Consumption.—In 2004, world refined copper consumption increased to 16.4 Mt from 15.4 Mt in 2003; African consumption of copper amounted to about 160,000 t in 2004. South Africa accounted for more than 80% of Africa's refined copper consumption (Themba, 2005b).

Outlook.—Copper mine production could nearly double by 2009. Output is likely to rise sharply in Zambia; the Chibulma South and the Kansanshi Mines are expected to open in 2005, and the Lumwana Copper Project, in 2006. Expansions are planned for the Mufulira and the Nkana Mines. Production in Congo (Kinshasa) could more than triple by 2009 because of the development of the Mutoshi Mine in 2006, the Kolwezi tailings project and the Tenke Mine in 2008, and the Ruashi Mine in 2009. Congolese production is likely to decline by 2011 because of the shutdown of Bwana Mkubwa and the Dikilushi Mine. In Mauritania, the Guelb Moghrein Mine is expected to start production in late 2005. Mining from a copper-rich zone at Bisha was likely to start in Eritrea in 2010 (table 7; Adastra Minerals Inc., 2005; Tenke Mining Corp., 2005; Yu and others, 2005, p. 1.4, 18.3, 18.22, 18.41).

The production of refined copper is expected to rise by an average of nearly 13% per year from 2004 to 2009. Most of the increase would be attributable to the reopening of the Konkola refinery in Zambia in 2007. In South Africa, production is expected to increase at the Palabora refinery (table 8).

Gold.—*Production.*—Africa's gold mine production was 555,000 kilograms in 2004, which was a decrease of 7% compared with that of 2003. Production was considerably less than that of 1990 because of the long-term decline in South African production (table 9). From 1990 to 2004, Africa's share of world gold mine production fell to about 23% from 32% (table 4).

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In South Africa, the decrease in production was broad based in 2004, with output falling at the Beatrix, the Blyvooruitzicht, the Kloof, the Mponeng, the North West, the Savuka, the Tau Lekoa, and the Tau Tona Mines. The decline in Ghana's production was partially attributable to lower output at the Bogoso Mine. Mali's output fell because of lower production at the Morila Mine. Production fell in Guinea because of a gold bullion export embargo by the Government. Tanzania's production increased because of higher production from the Bulyanhulu and the Geita Mines. The Mupane and the Samira Hill Mines opened in Botswana and Niger, respectively. Output also increased in Zimbabwe.

In 2004, South Africa accounted for 61% of African gold production; Ghana, 11%; Tanzania, 9%; and Mali, 7%. South Africa's share of continental gold production had fallen from 81% in 1995 and 89% in 1990 because of rising production costs associated with deeper underground operations and increased production in Ghana, Guinea, Mali, and Tanzania (table 9).

Outlook.—Gold mine production is expected to rise slightly from 2004 to 2009 and then to decline by about 4% from 2009 to 2011. The decreases in output in Mali, South Africa, and Tanzania could more than offset increased production in other countries between 2004 and 2011. The long-term decline in South Africa's production is likely to be reversed temporarily in 2009 because of the completion of the Moab Khotsong Mine in 2006, the Tshepong Decline project and the expansion of the Thistle Mine in 2008, the completion of the Phakisa Shaft in 2009, and the Masimong Mine expansion in 2010. By 2011, these projects could be more than offset by the shutdown of the Ergo and the North West Mines in 2005, the Savuka Mine in 2007, and the Thistle Mine in 2010, and lower production from the Driefontein and the Kloof Mines (table 9).

In Mali, production is expected to rise sharply by 2007 because of the opening of the Loulo Mine in 2005, the Tabakoto Mine in 2006, and the Syama Mine in 2007. By 2009, however, the shutdown of the Morila and the Yatela Mines could lead to a substantial decrease in production. Tanzania's production is likely to rise to 58 t by 2007 with the opening of the Tulawaka Mine in 2005 and the Buckreef Mine in 2006 and the increased capacity at the North Mara Mine; these increases could more than offset the decreased production at the Bulyanhulu and the Geita Mines. Production in Tanzania is expected to fall to 50 t in 2011 because of the planned closures of the Golden Pride and the Tulawaka Mines (table 9).

In Ghana, the outlook is for a modest increase in output because of higher production from the Wassa Mine. In Guinea, production is likely to increase because of the repeal of the bullion export embargo in late 2004. Botswana's output could increase sharply because of higher production from the Mupane Mine (table 9).

Several African countries that had only artisanal gold production in 2004 are likely to open large-scale gold mines in the near future. In Mauritania, the Guelb Moghrein copper mine is expected to start production in 2005, and the Tasiast gold mine, in 2007. The Taparko Mine is expected to open in Burkina Faso in 2006. Gold-rich zones in the Bisha Mine in Eritrea were planned to be mined from 2008 to 2010. In Congo (Kinshasa), the Kilo Moto Mine could open in 2009. By 2008, World Bank-sponsored projects in Madagascar and Uganda could lead to significant increases in reported artisanal gold production (table 9; Moto Goldmines Ltd., 2005; Yu and others, 2005, p. 1.4, 18.3, 18.22, 18.41).

Iron Ore.—*Production.*—In 2004, the iron content of ore produced in Africa amounted to 35 Mt. South Africa's production rose because of higher output at the Beeshok and the Sishen Mines. In Mauritania, output from Société Nationale Industrielle et Miniere increased. South Africa was the leading iron ore producer in Africa and accounted for 71% of continental output; Mauritania, 21%; and Egypt, 6%. In 1990, South Africa, Mauritania, and Egypt accounted for 60%, 21%, and 4%, respectively, of output (table 10).

Outlook.—The iron content of ore produced in Africa is expected to rise to 61.2 Mt in 2011 (table 10). In South Africa, the expansion of the Sishen Mine is likely to be completed in 2009. Production at the Bruce, the King, and the Mokaning Mines could start in 2009, and at the Sishen South Mine, in 2010. In Mauritania, the Guelb el Aouj iron ore project is expected to start production in 2009. The Faleme iron ore project in Senegal could start production in 2011.

Iron and Steel.—*Production.*—Africa's production of direct-reduced iron (DRI) and pig iron amounted to about 15 Mt in 2004. In South Africa, lower pig iron production more than offset higher output of DRI. Tunisia's production of pig iron ceased because of the shutdown of El Fouladh-Société Tunisienne des Siderurgie's blast furnace. Production increased in Libya and Zimbabwe from 2003 to 2004. From 1990 to 2004, South Africa's share of total African iron production fell to 51% from 66%. During the same period, Egypt's share rose to 29% from 15%. Algeria and Libya accounted for most of the remainder in 2004 (table 11).

From 1990 to 2004, the share of DRI in total African iron production rose to 39% from 20%. During the same period, the share of DRI in total iron production in Egypt increased to 60% from 39%; and in South Africa, to 21% from 13% (table 11).

In 2004, African production of crude steel remained nearly unchanged. South Africa accounted for 58% of regional crude steel production; Egypt, 27%; and Algeria and Libya, 6% each (table 12). Africa's share of world crude steel production amounted to nearly 2% in 2004 (table 4).

South Africa produced about 7.1 Mt of hot-rolled steel products in 2004; Libya, 867,000 t; and Tunisia, 130,000 t. Other African producers of hot-rolled steel products included Algeria, Egypt, and Morocco (International Iron and Steel Institute Committee on Economic Studies, 2005, p. 48).

Consumption.—Africa accounted for 2% of global finished steel consumption. Africa consumed 17.5 Mt of finished steel products in 2004 compared with 17.1 Mt in 2003 and 15.4 Mt in 1999 [MEPS (International), undated§].

Outlook.—The production of DRI and pig iron is expected to rise by an average of nearly 3% per year from 2004 to 2011. Nigeria could account for a majority of the increase in production because of the opening of the Ajaokuta steel plant in 2007. In South Africa, the increase would be attributable to the expansion of DRI capacity at the Vanderbijlpark steel plant in 2006 and pig iron capacity from 2006 to 2009. In Mozambique,

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pig iron production is expected to start in 2008 with the completion of the Corridor Sands project (table 11).

Crude steel production is expected to rise by an average of about 4% per year from 2004 to 2011. Nigeria, which accounted for less than 1% of African crude steel output in 2004, could increase its share to 9% by 2011 with the opening of the Ajaokuta steel plant in 2007. In South Africa, the expansion of the Vanderbijlpark steel plant was planned to take place from 2006 to 2009. In Algeria, restoration of capacity is expected to raise national steel production to 1.7 Mt by 2007. Libyan output is expected to approach full capacity by 2005. Production could rise in Zimbabwe as Zimbabwe Iron and Steel Company restores its capacity (table 12). African consumption of finished steel is expected to rise to 19 Mt by 2008 [MEPS (International), undated§].

Lead.—*Production.*—In 2004, African lead mine production fell by 13% compared with that of 2003 and 49% compared with that of 2000. In Namibia, output fell at the Rosh Pinah Mine. South Africa's production continued its decline because of lower production at the Black Mountain Mine. Production fell in Morocco and rose in Tunisia. In 2004, South Africa accounted for 42% of African lead mine production; Morocco 35%; and Namibia, 16% (table 13). Africa's share of the world's lead mine production was about 3% (table 4).

In 2004, African production of primary refined lead fell by 41% compared with that of 2003; the decrease may have been attributable to lower lead mine production in Morocco. Morocco, which was the leading African producer of primary refined lead, accounted for 88% of continental output. Production also fell in Algeria. South Africa accounted for 87% of African secondary refined lead output; Kenya, Morocco, and Nigeria accounted for the remainder of African secondary lead production. In 2004, African production of secondary refined remained nearly unchanged; higher production in Morocco offset lower output in South Africa. The share of primary lead in total refined lead production in Africa fell to 35% in 2004 from 64% in 1995 and 72% in 1990 (tables 14, 15).

Consumption.—In 2004, world refined lead consumption was about 7.08 Mt compared with 6.8 Mt in 2003. South African lead consumption increased to 80,700 t in 2004 from 78,700 t in 2003 (Maphango, 2005a).

Outlook.—The decline in African lead production is likely to be reversed, with output rising by 17% from 2004 to 2007. African production is expected to remain substantially lower than that of 2000. In South Africa, the expansion of the Black Mountain Mine in 2007 could increase production substantially. Tunisia's output is expected to fall with the closure of the Bougrine Mine; Namibia's production is also likely to decline (table 13). Primary and secondary refined lead production is expected to remain unchanged (table 14, 15).

Nickel.—*Production.*—African mine production of nickel fell by nearly 4% in 2004 compared with that of 2003; nickel was produced almost exclusively in southern African countries. Production decreased in Botswana and South Africa and increased in Zimbabwe. The majority of South Africa's nickel output was a coproduct of PGM mining. In 2004, South Africa accounted for 47% of African nickel mine output; Botswana, 42%; and Zimbabwe, 11% (table 16). Minor tonnages of nickel were recovered as a byproduct of cobalt operations in Morocco.

Consumption.—In 2004, South Africa's consumption of nickel increased to 25,000 t from 24,000 t in 2003. The stainless steel industry accounted for most of South Africa's nickel demand (Harding, 2005).

Outlook.—Nickel mine production is likely to increase by 80% from 2004 to 2009 and then decline by 5% from 2009 to 2011. The startup of the Ambatovy nickel and cobalt mine in 2008 in Madagascar is expected to account for the majority of the increase. Madagascar, which did not mine nickel in 2004, could have a 40% share of African nickel mine production in 2011. South Africa's output is expected to rise by about one-third by 2009, most of which would be attributable to increased capacity at the Nkomati Mine. In Zimbabwe, the Shangani Mine is expected to close by 2008, and the Hunter Road Mine, to open by 2011. Botswana's production is likely to fall because of the shutdown of the Selebi-Phikwe Mine in 2011 (table 16).

Platinum-Group Metals.—*Production.*—In 2004, Africa's production of palladium and platinum increased by 10% and 8%, respectively, compared with that of 2003. South African production rose because of higher output from the Kroondal, the Impala, the Modikwa, and the Rustenburg Mines. Production increased in Zimbabwe because of higher output from the Mimosa and the Ngezi Mines. South Africa, which was the continent's dominant producer of PGM in Africa, accounted for 97% and 96% of the production of platinum and palladium, respectively (tables 17, 18).

Outlook.—African mine production of palladium is expected to increase by an average of 3% per year from 2004 to 2011, and platinum, by between 2% and 3% per year (tables 17, 18). In South Africa, the increase is likely to be attributable to higher production from the Kroondal and the Modikwa Mines and the opening of the Two Rivers and the Everest Mines in 2005, higher production from Rustenburg by 2006, and the start of production from Nkomati in 2009. Higher output in Zimbabwe is likely to result from the expansion of the Ngezi Mine by 2006 and the opening of the Unki Mine by 2007.

Zinc.—*Production.*—Africa's mine production of zinc fell by about 4% in 2004 compared with that of 2003. South African production fell because the closure of the Maranda Mine more than offset higher output from the Black Mountain Mine. The decrease in Tunisia's production was attributable to lower output from the Bougrine Mine. In Algeria, output declined because of the shutdown of El Abed and the Kherzet Youcef Mines. Namibia's production increased because of the opening of the Skorpion Mine; production also increased in Morocco. In 2004, Morocco accounted for 37% of African zinc mine production; Namibia, 33%; South Africa, 16%; and Tunisia, 14% (table 19). Africa's share of world zinc mine production was about 2% (table 4).

In 2004, African production of zinc metal rose by 30% compared with that of 2003. In Namibia, production rose sharply at the Skorpion smelter. South Africa's production fell because of a shortage of zinc concentrates; output also declined in Algeria. Namibia, which did not produce zinc metal prior to 2002, accounted for 48% of continental zinc metal production

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in 2004. South Africa's share fell to 42% in 2004 from 75% in 2000, and Algeria's share, to 10% from 25% (table 20).

Consumption.—In 2004, world refined zinc consumption was about 10.5 Mt compared with nearly 9.9 Mt in 2003. South African zinc consumption increased to 90,900 t in 2004 from 86,000 t in 2003 (Maphango, 2005b).

Outlook.— African zinc mine production is likely to rise by 17% from 2004 to 2007. The majority of the increase could be attributable to higher production from the Hajar Mine in Morocco. In South Africa, the expansion of the Black Mountain Mine is expected to increase production substantially. Output is also likely to increase in Algeria. The depletion of the Bougrine Mine in 2005 could cause Tunisia's share of African zinc mine production to fall to less than 1% by 2007 (table 19). In Congo (Kinshasa), the proposed reopening of the Kipushi Mine and the reprocessing of zinc and germanium tailings near Kolwezi could lead to further increases in production, but whether these projects will be implemented by the end of 2011 is uncertain.

Higher production from the Skorpion smelter in Namibia could increase regional production of zinc metal by 12% by 2007. Namibia could account for 54% of Africa's zinc metal output in 2007 (table 20).

Industrial Minerals

Africa was a significant producer of several industrial minerals. In 2004, Botswana was the world's leading producer of diamond by value. Tanzania was the only producer of tanzanite in the world. Kenya, Madagascar, and Zambia were leading producers of ruby, sapphire, and emerald, respectively. South Africa accounted for nearly 40% of reported global vermiculite production.

Africa's consumption of sulfuric acid was mostly for agricultural purposes; this use reflected the continent's low level of industrialization. In recent years, cement consumption increased substantially in such countries as Ethiopia, Kenya, Mozambique, Tanzania, and Uganda.

Diamond.—*Production.*—In 2004, Africa's share of world diamond production by volume was 48%. African diamond production increased by more than 9% in 2004 compared with that of 2003. The increase in output was broadly based, with production rising in Angola, Botswana, Central African Republic, Congo (Kinshasa), Guinea, Namibia, Sierra Leone, South Africa, and Tanzania (tables 4, 21).

Congo (Kinshasa) accounted for the majority of the increase in production by volume. Increased political stability and the Kimberley Process led to higher production by artisanal miners. Sociètè Minièrè de Bakwanga (MIBA) also increased its output. The main cause of higher South African production was increased production at the Kimberley and the Venetia Mines. In Namibia, higher production was attributable to Namdeb Diamond Corporation (Pty) Ltd.'s increased output. Production also increased at the Williamson Mine in Tanzania. The Murowa Diamond Project commenced production in Zimbabwe. Botswana accounted for 35% of African diamond output by volume; Congo (Kinshasa), 35%; South Africa, 16%; and Angola, 7% (table 21).

In 2004, the global value of rough diamond production amounted to $10.6 billion, of which Africa accounted for more than 60%. Botswana accounted for 24% of the value of global rough diamond output; South Africa and Angola, 11% each; Congo (Kinshasa), 10%; and Namibia, 5% (Janse, 2005).

In November 2001, the Kimberley Process certification scheme was established to reduce the trade of conflict diamond, particularly diamond originating from Angola, Congo (Kinshasa), and Sierra Leone. The establishment of the Kimberley Process involved Government officials from more than 50 countries that produced, processed, and imported diamond as well as representatives from the European Union, the World Diamond Council, and nongovernmental organizations. As of October 2004, the following African countries had met the minimum requirements of the Kimberley Process Certification Scheme: Angola, Botswana, Central African Republic, Congo (Kinshasa), Côte d'Ivoire, Guinea, Lesotho, Mauritius, Namibia, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, and Zimbabwe.

Outlook.—The production of rough diamond is expected to rise by an average of nearly 2% per year from 2004 to 2011. In Angola, the majority of the projected increase in output would be attributable to the expansion of the Catoca Mine; Angola's share of African diamond production could rise to 11% in 2011. Production could also rise in Congo (Kinshasa) because of the planned expansion of MIBA's facilities by 2008. European Diamonds plc has plans to start mining in Lesotho in 2005. Zimbabwe's production could increase because of higher production from Murowa. Output is also expected to rise in Botswana, Namibia, and South Africa because of higher production at mines operated by DeBeers Group (table 21).

Phosphate Rock.—*Production.*—In 2004, the phosphorous pentoxide (P_2O_5) content of African phosphate rock production amounted to about 13.9 Mt. Output increased in Morocco and fell in Algeria and Togo in 2004. Morocco, which was the leading producer of phosphate rock in Africa, accounted for 61% of continental phosphate rock output in 2004; Tunisia, 17%; and South Africa, 8% (table 22).

Outlook.—The P_2O_5 content of African phosphate rock production is expected to increase to 14.8 Mt in 2009. In Morocco, planned expansions of the Khourigba Mines could increase Morocco's production to 9 Mt in 2007. In Senegal, production is expected to rise because of higher capacity at the Tobene Mine. Production is also expected to rise in Tunisia (table 22).

Mineral Fuels

Africa was a producer of mineral fuels; its share of world uranium production was nearly 20%. South Africa was a significant producer and exporter of bituminous coal. Most of Africa's natural gas production was in the northern part of the continent. Northern and western African countries were the most significant producers of crude petroleum. Niger was one of the world's leading producers of uranium. Africa's share of world mineral fuel consumption was modest.

Coal.—*Production.*—Regional coal production rose by 1% in 2004 compared with that of 2003. Most of the increase was attributable to South Africa; production increased at a number of

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mines that included the Goedehoop, the Grootegeluk, the New Denmark, the New Vaal, the Phoenix, the Tavistock, and the Tshikandeni. Output also increased in Botswana and Zambia and fell in Zimbabwe; the fall in Zimbabwe's production was the result of resource depletion at the M-Block underground mine. South Africa, which was the dominant coal producer in Africa, accounted for 98% of regional coal output; Zimbabwe, 1%; and others, less than 1% (table 23). More than 99% of South Africa's coal production was bituminous. Africa accounted for about 5% of total world anthracite and bituminous coal production.

Consumption.—Africa accounted for nearly 4% of world coal consumption in 2004. Within the region, South Africa accounted for 92% of African coal consumption. From 1999 to 2004, Africa's consumption of coal rose by about 14% (British Petroleum plc, 2005, p. 33).

Outlook.— African coal production is expected to increase by an average of 2% per year from 2004 to 2011. South Africa is likely to be responsible for the majority of the increase; its production could increase to 266 Mt by 2009. Higher output would be attributable to the opening of the Kriel South Mine in 2005 and the expansions of the Syferfontein, the Mafube, and the Grootegeluk Mines in 2005, 2007, and 2008, respectively. Mozambique is expected to become the second-ranked coal producer in Africa with the development of the Moatize Project in 2009. The National Development Corporation of Tanzania planned to start production at Mchuchuma in 2008. Zimbabwe's output could rise because of the opening of the 3 Main Mine. In Botswana, production is expected to rise at the Morupule Colliery because of domestic powerplant expansion. Production is also expected to rise in Malawi and Nigeria (table 23).

Natural Gas.—*Production.*—Regional production of dry natural gas increased by nearly 4% in 2004 from 2003. Nigeria accounted for most of the increase in output. In Libya, higher production was attributable to the startup of the Wafa Field. The North Tano, Songo Songo, and Temane projects started in Ghana, Tanzania, and Mozambique, respectively. Production also increased in Equatorial Guinea and Tunisia. In 2004, Algeria accounted for 59% of Africa's dry natural gas output; Nigeria, 21%; and Egypt, 11%. Nigeria's share of continental dry natural gas output was 5% in 1990 (table 24).

Consumption.—The African continent consumed nearly 3% of the world's natural gas. Africa's consumption rose to 68.6 billion cubic meters in 2004 compared with 66.7 billion cubic meters in 2003 and 50.9 billion cubic meters in 1999. Egypt accounted for 37% of Africa's dry natural gas consumption; Algeria, 31%; and others, 32% (British Petroleum plc, 2005, p. 25).

Outlook.—African production of dry natural gas is expected to rise by nearly 28% from 2004 to 2007 and by an additional 5% from 2007 to 2011. Algeria's output of natural gas is likely to increase because of new production from the In Amenas Field in 2005 and the Gassi Touil Field in 2007. In Libya, production is likely to increase to 8 billion cubic meters in 2011; new sources of gas could include Bahr Essalam. The increase in Nigeria's production is partially attributable to the West African Gas Pipeline, which is expected to be operational in 2006 and the planned elimination of natural gas flaring. Production could also increase at Temane in Mozambique and Songo Songo in Tanzania. Egypt's production is likely to start declining by 2009 (table 24).

Petroleum.—*Production.*—In 2004, African crude petroleum production increased by 10% compared with that of 2003. Nigeria's output rose as the result of an increased production quota authorized by OPEC. In Libya, the increase in production was partially attributable to the startup of the D and the Elephant Fields. Chad's output rose sharply because of the startup of the Bolobo and the Kome Fields. In Sudan, production started in Block 6. The increase in Angola's production was partially attributable to the startup of production in Block 15. Production also increased in Algeria and Equatorial Guinea. Nigeria accounted for 28% of regional crude petroleum production; Algeria, 19%; Libya, 18%; Angola, 11%; and Egypt, 7% (table 25). In 2004, Africa's share of world crude petroleum production amounted to 12% (table 4).

Consumption.—Regional consumption of petroleum products increased to 969 million barrels in 2004 from 939 Mbbl in 2003 and 895 Mbbl in 1999. Africa accounted for about 3% of world petroleum products consumption. Egypt accounted for 21% of African consumption of petroleum products; South Africa, 20%; Algeria, 9%; and others, 50% (British Petroleum plc, 2005, p. 9).

Outlook.—African crude petroleum production is expected to rise by nearly 18% from 2004 to 2007 and to show little change from 2007 to 2011. In Nigeria, annual output is likely to increase to 1.2 billion barrels in 2007. Nigeria's share of African crude petroleum production is expected to rise to 31% in 2011. Sources of additional production in Nigeria would include the Bonga field in 2005 and the Bosi, the Erha, and the Eti/Assa fields in 2006 and 2007. Sudan's output was expected to more than double by 2007 because of higher production from Block 6 and the opening of Blocks 3 and 7 in 2005 and Block 5A in 2006. In Libya, an increase in production is likely to be partially attributable to higher output from Elephant Field onshore Block NC-174 in the Murzuq Basin. The opening of the Baobab field in Côte d'Ivoire was planned for 2005. In Chad, the Doba field was expected to reach full production by 2005. Higher production was also expected from Block 15 in Angola. Output is also likely to increase in Algeria (table 25).

Uranium.—*Production.*—In 2004, African uranium production rose by 19% compared with that of 2003. Most of the increase was attributable to higher production at the Rossing Mine in Namibia; Niger's output also increased. Niger accounted for 46% of African uranium production; Namibia, 43%; and South Africa, 11%. In 1990, Niger's and South Africa's shares of continental production were 30% and 27%, respectively (table 26). Africa accounted for about 19% of the world's uranium production in 2004 (table 4).

Consumption.—South Africa was the only regional consumer of uranium in 2003. Africa accounted for less than 1% of the electricity generated worldwide by nuclear power (British Petroleum plc, 2005, p. 34).

Outlook.—Continental uranium mine production is expected to rise by more than 4% per year from 2004 to 2011 (table 26). In South Africa, the Dominion mine was expected to open in 2007 and to produce more than 1,500 t/yr of uranium in 2010 (Mining Review Africa, 2005). Paladin Resources Ltd. of

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Australia was considering the development of the Kayelekera Project in Malawi, which could produce about 850 t/yr of uranium starting in 2008 or 2009. Africa's share of world uranium mine production is likely to be about 16% in 2011.

Trade Review and Outlook

Africa's current account surplus amounted to 0.1% of the GDP in 2004; the current account deficit amounted to 0.5% of the GDP in 2003. In 2004, sub-Saharan countries ran an average deficit of 2.1% of the GDP, and countries in the Arab Maghreb Union ran an average surplus of 7.1% of the GDP. Trade surpluses in oil-exporting countries were more than offset by trade deficits in oil-importing countries (International Monetary Fund, 2005b, p. 49).

Oil-importing countries had an average current account deficit of 2.8% of the GDP in 2004, and oil-exporting countries, an average current account surplus of 7.3% of the GDP. The terms of trade worsened for oil-importing countries and improved for oil-exporting countries because of rising oil prices in 2004. The average current account deficit for oil-importing countries is expected to increase to 3.7% of the GDP in 2005 and to 3.5% of the GDP in 2006. For oil-exporting countries, the surplus is predicted to rise to 12.8% of the GDP in 2005 and 17.3% of the GDP in 2006. Africa was expected to run a current account surplus of 1.6% of the GDP in 2005 and 3.5% of the GDP in 2006 (International Monetary Fund, 2005b, p. 49).

In 2004, mineral fuels accounted for more than 90% of the export earnings of Algeria, Equatorial Guinea, Libya, and Nigeria. Minerals and mineral fuels accounted for more than 90% of the export earnings of Sierra Leone (diamond) and more than 80% of the export earnings of Botswana (in order of value, diamond, copper, nickel, and soda ash), Congo (Brazzaville) (petroleum), Congo (Kinshasa) (diamond, petroleum, cobalt, and copper), Gabon (petroleum and manganese), Guinea (bauxite, alumina, gold, and diamond), and Sudan (petroleum and gold). Minerals and mineral fuels accounted for more than 50% of the export earnings of Mali (gold), Mozambique (aluminum and petroleum products), Namibia (diamond, uranium, gold, and zinc), Tanzania (gold, diamond, and colored gemstones), and Zambia (copper and cobalt). Gold was also a significant source of export earnings in Ghana and South Africa. Diamond was a significant source of export earnings in the Central African Republic and South Africa as was iron ore in Mauritania and uranium in Niger (International Monetary Fund, 2005a, p. 86; 2006, p. 67).

Europe's share of Africa's natural gas exports amounted to 93%, and liquefied natural gas (LNG) exports, 88%. Jordan and Tunisia accounted for the remainder of natural gas exports. The United States accounted for 10% of LNG exports, and countries in the Asia and Pacific region, 2% (British Petroleum plc, 2005, p. 28).

In 2004, Europe accounted for 35% of Africa's petroleum exports; the United States, 29%; China, 10%; Japan, 2%; and other countries in the Asia and the Pacific region, 14%. West African countries sent 40% of their exports to the United States and 37% to China, Japan, and other countries in the Asia and the Pacific region. North African countries sent 66% of their exports to Europe and 16% to the United States. Intraregional exports to African countries amounted to only 2% of total African petroleum exports (British Petroleum plc, 2005, p. 18).

Intraregional minerals trade was, however, significant for gold. South Africa imported about 150,000 kilograms per year of gold mostly from West African countries to supply its gold refinery. A majority of African gold mine production was refined in South Africa prior to export to other regions.

Most of Africa's copper production was also exported in refined form. For other commodities, which included bauxite, colored gemstones, diamond, iron ore, petroleum, and uranium, most or all of the continent's production was exported prior to downstream processing.

Environment

Deforestation for fuel use and land-intensive agricultural production continues to be a significant environmental issue in many African countries. Other causes of deforestation included artisanal production of gemstones and lime. The West African Pipeline Project, which was expected to be completed in 2006, could help mitigate the effects of deforestation in Benin, Ghana, and Togo and reduce the emissions of greenhouse gases. Currently (2004), natural gas is being flared by Nigeria; in the future, Nigeria expects to export natural gas to Benin, Ghana, and Togo. The Government of Nigeria has committed to ending the flaring of natural gas, which will also lead to decreased pollution.

The use of mercury by artisanal gold miners has led to serious air and water pollution in such African countries as Ghana, Kenya, Mozambique, South Africa, Sudan, Tanzania, and Zimbabwe. The Global Environment Facility, the United Nations Development Program, and the United Nations Industrial Development Organization began the Global Mercury Project in August 2002 to alleviate these problems. The Global Mercury Project has been providing cleaner technologies and training for miners, conducting health assessments, and helping institute Government regulatory capacities.

References Cited

Adastra Minerals Inc., 2005, Adastra secures subsurface exploration rights at Kolwezi: London, United Kingdom, Adastra Minerals Inc. press release, October 12, 2 p.

Alcan Inc., 2004, Coega smelter project—Alcan, South African Government to conduct new feasibility study: Montreal, Quebec, Canada, Alcan Inc. press release, November 18, 1 p.

British Petroleum plc, 2005, Statistical review of world energy June 2005: London, United Kingdom, British Petroleum plc, 41 p.

Global Witness, 2005, Under-mining peace—The explosive trade in cassiterite in eastern DRC: Washington, DC, Global Witness Publishing Inc., 39 p.

Harding, A.J., 2005, Nickel, *in* South Africa's mineral industry, 2004/2005: Johannesburg, South Africa, Department of Minerals and Energy of the Republic of South Africa, p. 83-86.

Hill, Liezel, 2006, Tough talks on Mozal power supply: Australia's Paydirt, v. 1, no. 124, December 2005/January 2006, p. 46.

Human Rights Watch, 2005, The curse of gold: New York, New York, Human Rights Watch, 159 p.

Digitized by Google

International Iron and Steel Institute Committee on Economic Studies, 2005, Steel statistical yearbook 2005: Brussels, Belgium, International Iron and Steel Institute Committee on Economic Studies, 104 p.
International Monetary Fund, 2005a, Democratic Republic of the Congo—Selected issues and statistical appendix: Washington, DC, International Monetary Fund, October 14, 97 p.
International Monetary Fund, 2005b, World economic outlook—Building institutions: Washington, DC, International Monetary Fund, 293 p.
International Monetary Fund, 2006, Zambia—Selected issues and statistical appendix: Washington, DC, International Monetary Fund, March 21, 72 p.
Janse, Bram, 2005, The search for diamonds: Mining Journal, August 19, p. 18-25.
Maphango, L., 2005a, Lead, *in* South Africa's mineral industry, 2004/2005: Johannesburg, South Africa, Department of Minerals and Energy of the Republic of South Africa, p. 80-82.
Maphango, L., 2005b, Zinc, *in* South Africa's mineral industry, 2004/2005: Johannesburg, South Africa, Department of Minerals and Energy of the Republic of South Africa, p. 89-92.
Metals Economics Group, 2004a, Overview of worldwide exploration budgets—Targets and stages of development: Strategic Report, v. 17, no. 6, November/December, p. 7-11.
Metals Economics Group, 2004b, Overview of worldwide exploration budgets—Trends and locations: Strategic Report, v. 17, no. 6, November/December, p. 1-6.
Mining Journal, 2004a, Senegalese mining code: Mining Journal, April 8, p. 9.
Mining Journal, 2004b, South Africa's new policy on exploration: Mining Journal, July 16, p. 16.
Mining Journal, 2005, Exploration to resume in Eritrea: Mining Journal, January 21, p. 13.
Mining Review Africa, 2005, Plans to triple South Africa's uranium production by 2010: Mining Review Africa, no. 6, p. 38-39.
Moto Goldmines Ltd., 2005, Moto Goldmines study shows potential for a significant gold mining operation: Balcatta, Australia, Moto Goldmines Ltd. press release, November 15, 3 p.
Mwape, P., Roberts, M.J., Mokwena, E., and Tjatjie, T., 2004, General review, *in* South Africa's Mineral Industry 2003/2004: Johannesburg, South Africa, Department of Minerals and Energy, p. 1-30.
Mwape, P., Roberts, M.J., Mokwena, E., Tjatjie, T., and Phale, M., 2005, General review, *in* South Africa's Mineral Industry 2004/2005: Johannesburg, South Africa, Department of Minerals and Energy of the Republic of South Africa, p. 1-23.
Tenke Mining Corp., 2005, DRC approves Tenke Fungurume project: Vancouver, British Columbia, Canada, Tenke Mining Corp. press release, November 2, 2 p.
Themba, L.A., 2005a, Aluminum, *in* South Africa's mineral industry, 2004/2005: Johannesburg, South Africa, Department of Minerals and Energy of the Republic of South Africa, p. 64-68.
Themba, L.A., 2005b, Copper, *in* South Africa's mineral industry, 2004/2005: Johannesburg, South Africa, Department of Minerals and Energy of the Republic of South Africa, p. 77-79.
Yu, F.Y., Reddy, Douglas, Breisbois, Ken, and Melnyk, Lydell, 2005, Bisha property, Gash-Barka District, Eritrea—43-101 technical report and preliminary assessment: Oakville, Ontario, Canada, Amec Americas Ltd., 188 p.

Internet References Cited

MEPS (International), [undated], World steel consumption forecast to reach 1.05 billion tonnes in 2008, accessed July 11, 2005, at URL http://www.meps.co.uk/article-global2008-update-con.htm.
Rio Tinto plc, 2004, South Africa mining charter, December 1, accessed February 17, 2005, at URL http://www.riotinto.com/media.
World Bank Group, 2004, Mining policy and reform—Projects, accessed February 17, 2005, at URL http://www.worldbank.org/ogmc/wbminingpolicyprojects.htm.

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TABLE 1

AFRICA: AREAL EXTENT AND ESTIMATED POPULATION IN 2004[1]

Country	Area[2] (square kilometers)	Estimated population[3] (millions)
Algeria	2,381,740	32.4
Angola	1,246,700	14.0
Benin	112,620	6.9
Botswana	600,370	1.7
Burkina Faso	274,200	12.4
Burundi	27,830	7.3
Cameroon	475,440	16.4
Cape Verde	4,033	0.5
Central African Republic	622,984	4.0
Chad	1,284,200	8.8
Comoros	2,170	0.6
Congo (Brazzaville)	342,000	3.9
Congo (Kinshasha)	2,345,410	54.8
Cote d'Ivoire	322,460	17.1
Djibouti	23,000	0.7
Egypt	1,001,450	68.7
Equatorial Guinea	28,051	0.5
Eritrea	121,320	4.5
Ethiopia	1,127,127	70.0
Gabon	267,667	1.4
Gambia, The	11,300	1.5
Ghana	239,460	21.1
Guinea	245,857	8.1
Guinea-Bissau	36,120	1.5
Kenya	582,650	32.5
Lesotho	30,355	1.8
Liberia	111,370	3.5
Libya	1,759,540	5.7
Madagascar	587,040	17.3
Malawi	329,750	11.2
Mali	1,240,000	11.9
Mauritania	1,030,700	2.9
Mauritius[4]	2,040	1.2
Mayotte	374	0.2
Morocco	446,550	30.6
Mozambique	801,590	19.1
Namibia	825,418	2.0
Niger	1,267,000	12.1
Nigeria	923,768	140.0
Reunion	2,517	1 [2]
Rwanda	26,338	8.4
Sao Tome & Principe	1,001	0.2
Senegal	196,190	10.5
Seychelles	455	0.1
Sierra Leone	71,740	5.4
Somalia	637,657	9.9
South Africa	1,219,912	45.6
Sudan	2,505,810	34.4
Swaziland	17,363	1.1
Tanzania[5]	945,087	36.6
Togo	56,785	5.0
Tunisia	163,610	10.0
Uganda	236,040	25.9
Western Sahara	266,000	0.3 [2]

See footnotes at end of table.

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TABLE 1--Continued

AFRICA: AREAL EXTENT AND ESTIMATED POPULATION IN 2004[1]

Country	Area[2] (square kilometers)	Estimated population[3] (millions)
Zambia	752,614	10.5
Zimbabwe	390,580	13.2
Total	30,571,353	868
United States	9,631,418 [6]	294
World	148,940,000	6,345

NA Not applicable.

[1]Includes data available through February 2005. Population estimates are rounded to no more than three significant digits.

[2]Source: U.S. Central Intelligence Agency, World Factbook 2004.

[3]Source: World Bank 2005, World Development Indicators Database.

[4]Includes Agalega Islands, Cargados Carajos Shoals (Saint Brandon), and Rodriguez.

[5]Includes the islands of Mafia, Pemba, and Zanzibar.

[6]Includes only the 50 States and the District of Columbia.

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TABLE 2
AFRICA: GROSS DOMESTIC PRODUCT IN 2004[1, 2]

Country	Estimated GDP[3] (billions)	Estimated GDP[3] per capita	Real GDP annual percentage change[4]
Algeria	$217.2	$6,799	5.2%
Angola	36.8	2,457	11.1%
Benin	7.9	1,094	3.1%
Botswana	16.2	10,169	4.9%
Burkina Faso	15.7	1,258	4.6%
Burundi	5.2	708	4.8%
Cameroon	37.8	2,176	3.5%
Cape Verde	2.8	5,858	4.4%
Central African Republic	4.5	1,107	1.3%
Chad	12.8	1,555	29.7%
Comoros	1.0	1,660	1.9%
Congo (Brazzaville)	4.1	1,267	3.6%
Congo (Kinshasa)	37.0	633	6.8%
Cote d'Ivoire	26.6	1,436	1.6%
Djibouti	1.6	1,878	3.0%
Egypt	282.3	4,072	4.1%
Equatorial Guinea	16.7	33,994	32.8%
Eritrea	4.1	909	1.8%
Ethiopia	57.8	814	11.5%
Gabon	9.2	6,922	1.4%
Gambia, The	2.8	1,903	5.1%
Ghana	50.4	2,475	5.8%
Guinea	17.8	1,919	2.7%
Guinea-Bissau	1.1	730	4.3%
Kenya	34.8	1,062	4.3%
Lesotho	4.8	2,074	3.0%
Liberia	3.3 [5, 6]	1,000 [5, 6]	3.0% [5, 6]
Libya	35.0 [5, 6]	6,400 [5, 6]	3.2% [5, 6]
Madagascar	14.9	854	5.3%
Malawi	7.0	569	4.6%
Mali	12.5	1,024	2.2%
Mauritania	6.4	2,187	6.9%
Mauritius	14.9	12,215	4.3%
Mayotte	466.8 [5, 6]	2,600 [5, 7]	NA [5]
Morocco	129.3	4,332	4.2%
Mozambique	23.7	1,247	7.2%
Namibia	13.4	6,449	4.2%
Niger	10.5	865	0.9%
Nigeria	159.8	1,120	6.0%
Reunion	4.3 [5, 6]	5,800 [5, 8]	2.5% [5, 6]
Rwanda	11.6	1,351	4.0%
São Tomé and Príncipe	0.2	1,529	3.8%
Senegal	18.9	1,813	6.2%
Seychelles	1.0	11,847	-2.0%
Sierra Leone	4.5	842	7.4%
Somalia	4.4 [5, 6]	500 [5, 6]	2.1% [5, 6]
South Africa	$501.7	$10,798	3.7%
Sudan	77.4	2,246	6.9%
Swaziland	5.4	4,995	2.1%
Tanzania	24.7	673	6.7%
Togo	8.5	1,564	2.9%
Tunisia	77.4	7,732	5.8%
Uganda	44.7	1,728	5.8%

See footnotes at end of table

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TABLE 2--Continued
AFRICA: GROSS DOMESTIC PRODUCT IN 2004[1, 2]

Country	Estimated GDP[3] (billions)	Estimated GDP[3] per capita	Real GDP annual percentage change[4]
Western Sahara	NA [5]	NA [5]	NA [5]
Zambia	9.9	870	5.0%
Zimbabwe	27.1	2,309	-4.2%
Total	2,628.2	3,027.0	NA
United States	11,605.0	39,496.0	4.2%
World	55,655.0	NA	5.1%

NA Not available
[1]Source: International Monetary Fund, World Economic Outlook Database, September 2005.
[2]Table data compiled September 2005; may be different from what is presented in previously written individual country chapters.
[3]Gross domestic product based on purchasing power parity.
[4]Compared with 2003.
[5]Source: U.S. Central Intelligence Agency, World Factbook 2004.
[6]2003 estimate.
[7]1998 estimate.
[8]2001 estimate.

TABLE 3
SELECTED SIGNIFICANT AFRICAN EXPLORATION SITES IN 2004

Country	Type[1]	Site	Commodity[2]	Company	Resource[2, 3]	Exploration[4]
Algeria	P	Tirek-Amesmessa	Au	GMA Resources plc.	1.38 Moz Au	Extensive drilling.
Burkina Faso	E	Essakan	Au	Orezone Resources Inc.	1.9 Moz Au	Do.
Central African Republic	E	Bambari/Passendro	Au	Axmin Inc.	457,000 oz Au	Do.
Congo (Kinshasa)	F	Lufua	Cu, Co	First Quantum Minerals Ltd.	1 Mt Cu, 15,000 t Co	Feasibility drilling.
Do.	E	Moto area	Au	Moto Goldmines Ltd.	607,000 oz Au	Extensive drilling.
Côte d'Ivoire	F	Bonikro	Au	Equigold NL	1 Moz Au	Feasibility drilling.
Eritrea	E	Asmara/Debarwa	Cu, Au	Sunridge Gold Corp.	Data not released	Extensive drilling.
Do.	E	Bisha	Cu, Zn, Au, Ag	Nevsun Resources Ltd.	(5)	Do.
Ghana	P	Bogoso/Prestea	Au	Golden Star Resources Ltd.	2.9 Moz Au	Do.
Do.	E	Bui/Tombe-Parabu	Au	Birim Goldfields, Inc.	Data not released	Do.
Do.	D	Chirano	Au	Red Back Mining NL	1.8 Moz Au	Do.
Guinea	F	Lero area	Au	Guinor Gold Corp.	2.7 Moz Au	Feasibility drilling.
Madagascar	F	Ambatovy	Ni, Co	Dynatec Corp.	2 Mt Ni, 190,000 t Co	Do.
Mali	E	Kofi	Au	Axmin Inc.	106,000 oz Au	Extensive drilling.
Do.	D	Loulo	Au	Randgold Resources Ltd.	4.2 Moz Au	Do.
South Africa	F	Burnstone	Au	Great Basin Gold Ltd.	6.3 Moz Au	Feasibility drilling.
Do.	E	Drenthe/Overysel	PGM, Au, Ni	Anooraq Resources Corp.	4.1 Moz 3PGE+Au	Extensive drilling.
Do.	P	Messina/Dwaalkop	PGM, Au	SouthernEra Resources Ltd.	9.1 Moz 5PGE+Au	Do.
Tanzania	E	Chocolate Reef	Au	Barrick Gold Corp.	Data not released	Do.
Do.	E	Kabanga	Ni	do.	do.	Do.

[1]D--Approved for development; E--Active exploration; F--Feasibility work ongoing/completed; P--Exploration at producing site.
[2]Abbreviations used for commodities in this table include the following: Ag--silver; Au--gold; Co--cobalt; Cu--copper; Ni--nickel; PGM--platinum-group metals; Zn--zinc. Abbreviations used for units of measure include the following: Moz--million troy ounces; Mt--million metric tons; oz--troy ounces; t--metric tons; 3PGE--palladium, platinum, and rhodium; 5PGE--osmium, palladium, platinum, rhodium, and ruthenium.
[3]Based on 2004 data reported from various sources, values vary from measured reserves to identified resources. Data not verified by U.S. Geological Survey.
[4]Sites where extensive (greater than 10,000 meters) drilling or significant (more than $5 million) expenditures have been reported.
[5]Content of principal metal 265,000 t Cu, 760,000 t Zn, 1 Moz Au. Deposit also contains significant silver.

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TABLE 4

AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2004[1]

(Thousand metric tons unless otherwise specified)

			Metals									
	Aluminum		Chromite, mine output, gross weight	Cobalt, mine output, Co content (metric tons)	Copper, mine output, Cu content	Gold, mine output (kilograms)	Iron and steel		Lead, mine output, Pb content (metric tons)	Manganese ore, mine output, Mn content	Zinc, mine output, Zn content (metric tons)
Country	Bauxite	Metal[2]					Iron ore, gross weight	Steel, crude			
Algeria	--	--	--	--	--	597 p	1,414 p	1,014 p	--	--	231 p
Angola	--	--	--	--	--	--	--	--	--	--	--
Benin	--	--	--	--	--	20	--	--	--	--	--
Botswana	--	--	--	--	29	162	--	--	--	--	--
Burkina Faso	--	--	--	--	--	1,125	--	--	--	--	--
Burundi	--	--	--	--	--	2,900 e	--	--	--	--	--
Cameroon	--	86 e	--	--	--	1,500 e	--	--	--	--	--
Cape Verde	--	--	--	--	--	--	--	--	--	--	--
Central African Republic	--	--	--	--	--	7 e	--	--	--	--	--
Chad	--	--	--	--	--	150 e	--	--	--	--	--
Comoros	--	--	--	--	--	--	--	--	--	--	--
Congo (Brazzaville)	--	--	--	--	--	60 e	--	--	--	--	--
Congo (Kinshasa)	--	--	--	8,900	73	5,700 e	--	130	--	--	--
Cote d'Ivoire	--	--	--	--	--	1,219	--	--	--	--	--
Djibouti	--	--	--	--	--	--	--	--	--	--	--
Egypt	--	215 e	--	--	--	--	2,500 e	4,400 e	--	8 e	--
Equatorial Guinea	--	--	--	--	--	500 e	--	--	--	--	--
Eritrea	--	--	--	--	--	33	--	--	--	--	--
Ethiopia	--	--	--	--	--	3,443 e	--	--	--	--	--
Gabon	--	--	--	--	--	70 e	--	--	--	1,236	--
Gambia, The	--	--	--	--	--	--	--	--	--	--	--
Ghana	498 e	--	--	--	--	63,139	--	--	--	559 e	--
Guinea	15,000 e	--	--	--	--	10,700	--	--	--	--	--
Guinea-Bissau	--	--	--	--	--	--	--	--	--	--	--
Kenya	--	2 e	--	--	--	1,600	1 e	--	--	--	--
Lesotho	--	--	--	--	--	--	--	--	--	--	--
Liberia	--	--	--	--	--	20	--	--	--	--	--
Libya	--	--	--	--	--	--	--	1,026	--	--	--
Madagascar	--	--	77	--	--	5	--	--	--	--	--
Malawi	--	--	--	--	--	--	--	--	--	--	--
Mali	--	--	--	--	--	37,974	--	--	--	--	--
Mauritania	--	--	--	--	--	--	11,000	5 e	--	--	--
Mauritius	--	--	--	--	--	--	--	--	--	--	--

See footnotes at end of table.

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TABLE 4--Continued

AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2004[1]

(Thousand metric tons unless otherwise specified)

			Metals--Continued									
	Aluminum		Chromite,	Cobalt,	Copper,	Gold,	Iron and steel		Lead,	Manganese	Zinc,	
Country	Bauxite	Metal[2]	mine output, gross weight	mine output, Co content (metric tons)	mine output, Cu content	mine output (kilograms)	Iron ore, gross weight	Steel, crude	mine output, Pb content (metric tons)	ore, mine output, Mn content	mine output, Zn content (metric tons)	
Morocco and Western Sahara	--	--	--	1,600 e	4 p	1,200 p	10	5 e	31,300 e	4	74,600	
Mozambique	7	549	--	--	--	56	--	--	--	--	--	
Namibia	--	--	--	--	11	2,205	--	--	14,338	--	66,028	
Niger	--	--	--	--	--	684	--	--	--	--	--	
Nigeria	--	--	--	--	--	30 e	--	10 e	200 e, 3	--	--	
Reunion	--	--	--	--	--	--	--	--	--	--	--	
Rwanda	--	--	--	--	--	--	--	--	--	--	--	
Sao Tome and Principe	--	--	--	--	--	--	--	--	--	--	--	
Senegal	--	--	--	--	--	600 e	--	--	--	--	--	
Seychelles	--	--	--	--	--	--	--	--	--	--	--	
Sierra Leone	--	--	--	--	--	1,000 e	--	--	--	--	--	
Somalia	--	--	--	--	--	--	--	--	--	--	--	
South Africa	--	863 p	7,677 p	280 e	103 p	340,500 p	39,322 p	9,504 p	37,485 p	1,905 p	32,310	
Sudan	--	--	26	--	--	5,000 e	--	--	--	--	--	
Swaziland	--	--	--	--	--	--	--	--	--	--	--	
Tanzania	--	--	--	--	4	51,010	--	--	--	--	--	
Togo	--	--	--	--	--	--	--	--	--	--	--	
Tunisia	--	--	--	--	--	--	244 p	70 p	5,500 e	--	29,011	
Uganda	--	--	--	--	--	178	--	7 e	--	--	--	
Zambia	--	--	--	13,000 e	427	--	--	--	--	--	--	
Zimbabwe	--	--	668 p	-- p	2 p	21,330 p	283 p	180 e	--	--	--	
Total	15,500	1,720	8,450	23,800	654	555,000	54,800	16,400	88,800	3,710	202,000	
Share of world total	10.5%	4.9%	47.8%	44.7%	4.6%	22.8%	4.1%	1.6%	2.9%	38.2%	2.2%	
United States	NA	2,520	--	--	1,160	258,000	54,700	99,700	445,000	--	739,000	
Share of world total	NA	7.2%	--	--	8.1%	10.6%	4.0%	9.5%	14.4%	--	8.1%	
World total	147,000	35,200	17,700	53,200	14,300	2,430,000	1,350,000	1,040,000	3,090,000	9,720	9,140,000	

See footnotes at end of table.

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TABLE 4--Continued

AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2004[1]

(Thousand metric tons unless otherwise specified)

	Industrial minerals				Mineral fuels			
Country	Cement, hydraulic	Diamond, natural (thousand carats)[4]	Graphite (metric tons)	Phosphate rock, gross weight	Coal, anthracite and bituminous	Petroleum, crude (thousand 42-gallon barrels)	Uranium, U_3O_8 content (metric tons)	Uranium, U_3O_8 content (metric tons)
Algeria	9,000 e	--	--	805 p	--	604,000 p	--	--
Angola	740 e	6,100 5, 6	--	--	--	362,000 p	--	--
Benin	250 e	--	--	--	--	--	--	--
Botswana	--	31,125 7	--	--	916	--	--	--
Burkina Faso	30 e	--	--	2 e	--	--	--	--
Burundi	--	--	--	--	--	--	--	--
Cameroon	930 e	--	--	--	--	34,700 p	--	--
Cape Verde	--	--	--	--	--	--	--	--
Central African Republic	--	350 p	--	--	--	--	--	--
Chad	--	--	--	--	--	61,400	--	--
Comoros	--	--	--	--	--	--	--	--
Congo (Brazzaville)	--	--	--	--	--	82,100	--	--
Congo (Kinshasa)	403	30,880	--	--	1 e	10,100	--	--
Cote d'Ivoire	650 e	230 e	--	--	--	7,430	--	--
Djibouti	--	--	--	--	--	--	--	--
Egypt	28,000	--	--	2,219	100 e	222,000 e	--	--
Equatorial Guinea	--	--	--	--	--	125,000 e	--	--
Eritrea	45 e	--	--	--	--	--	--	--
Ethiopia	1,300 e	--	--	--	--	--	--	--
Gabon	350 e	1 e	--	--	--	87,200	--	--
Gambia, The	--	--	--	--	--	--	--	--
Ghana	1,900 e	905	--	--	--	3,000 e	--	--
Guinea	360 e	740	--	--	--	--	--	--
Guinea-Bissau	--	--	--	--	--	--	--	--
Kenya	1,789	--	--	--	--	--	--	--
Lesotho	--	4 e	--	--	--	--	--	--
Liberia	40 e	10 e	--	--	--	--	--	--
Libya	3,500 e	--	--	--	--	587,000 e	--	--
Madagascar	110 e	--	15,000 e	--	--	--	--	--
Malawi	190 e	--	--	--	41	--	--	--
Mali	--	--	--	--	--	--	--	--
Mauritania	200 e	--	--	--	--	--	--	--

See footnotes at end of table.

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TABLE 4--Continued

AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2004[1]

(Thousand metric tons unless otherwise specified)

	Industrial minerals				Mineral fuels			
Country	Cement, hydraulic	Diamond, natural (thousand carats)[4]	Graphite (metric tons)	Phosphate rock, gross weight	Coal, anthracite and bituminous	Petroleum, crude (thousand 42-gallon barrels)	Uranium, U_3O_8 content (metric tons)	Uranium, U_3O_8 content (metric tons)
Mauritius	--	--	--	--	--	--	--	--
Morocco and Western Sahara	11,000 e	--	--	25,369	(8) e	246	--	--
Mozambique	350 e	--	--	--	17	--	--	--
Namibia	--	2,004	--	--	--	--	3,583	3,583
Niger	40 e	--	--	--	183 e	--	3,870	3,870
Nigeria	2,300 e	--	--	--	9 e	900,000	--	--
Reunion	380 e	--	--	--	--	--	--	--
Rwanda	104	--	--	--	--	--	--	--
Sao Tome and Principe	--	--	--	--	--	--	--	--
Senegal	1,700 e	--	--	1,804 p	--	--	--	--
Seychelles	--	--	--	--	--	--	--	--
Sierra Leone	180	692	--	--	--	--	--	--
Somalia	--	--	--	--	--	--	--	--
South Africa	--	14,293	--	2,735	242,747	6,770	888 p	888 p
Sudan	280 e	--	--	--	--	118,000	--	--
Swaziland	--	--	--	--	550 e	--	--	--
Tanzania	1,281	304	--	7	65	--	--	--
Togo	800 e	--	--	1,115	--	--	--	--
Tunisia	7,124	--	--	7,954	--	25,700 p	--	--
Uganda	520 e	--	--	--	--	--	--	--
Zambia	525 e	--	--	--	240 e	--	--	--
Zimbabwe	400 e	--	10,267	83	2,476	--	--	--
Total	76,800	87,800	25,300	42,100	247,000	3,240,000	8,340	8,340
Share of world total	3.6%	48.5%	2.6%	30.1%	5.4%	12.0%	18.5%	18.5%
United States	99,000	--	--	35,800	933,000	6,500,000	1,040	1,040
Share of world total	4.6%	--	--	25.6%	20.5%	24.0%	2.3%	2.3%
World total	2,150,000	181,000	983,000	140,000	4,550,000	27,100,000	45,100	45,100

eEstimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. pPreliminary. NA Not available. -- Zero or zero percent.

[1]Totals may not add owing to independent rounding. Percentages are calculated on unrounded data. Table includes data available as of March 31, 2006.

[2]Primary and secondary production.

[3]Produced as a lead-zinc ore.

[4]Gemstones and industrial diamond.

[5]Does not include smuggled production.

[6]Production was approximately 90% gem and 10% industrial grade.

[7]Assumed to contain about 70% gem and near gem.

[8]Less than 1/2 unit.

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TABLE 5
AFRICA: HISTORIC AND PROJECTED BAUXITE PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Ghana	381	513	504	498	500	500	500
Guinea	15,800	15,800	15,700	15,000	15,000	27,000	27,000
Mozambique	7	11	8	7	8	8	8
Sierra Leone	1,430	--	--	--	--	--	--
Total	17,600	16,300	16,200	15,500	15,500	27,500	27,500

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

TABLE 6
AFRICA: HISTORIC AND PROJECTED ALUMINUM PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Cameroon	93	79	86	86	90	90	90
Egypt	179	180	189	215	200	200	200
Ghana	174	135	137	--	--	--	--
Kenya[2]	--	2	2	2	2	2	2
Mozambique	--	--	54	549	550	680	800
Nigeria	--	--	--	--	--	100	190
South Africa	159	229	673	863	870	1,530	1,530
Total	600	630	1,100	1,700	1,700	2,600	2,800

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Kenya produced secondary refined aluminum; primary production in all other African countries.

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TABLE 7

AFRICA: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 1990-2011[1]

(Metal content in thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Botswana	25	25	35	29	35	40	40
Congo (Kinshasa)	509	29	31	73	117	232	160
Eritrea	--	--	--	--	--	--	70
Mauritania	--	--	--	--	30	30	30
Morocco	16	14	7	4	4	4	4
Namibia	28	23	6	11	25	25	25
South Africa	179	166	137	103	107	107	107
Tanzania[2]	--	--	--	4	4	4	4
Zambia	519	316	249	427	700	800	800
Zimbabwe	14	9	2	2	2	2	2
Total	1,300	580	470	650	1,000	1,200	1,200

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Copper contained in concentrates and doré.

TABLE 8

AFRICA: HISTORIC AND PROJECTED REFINED COPPER PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Botswana	--	--	--	(3)	NA	NA	NA
Congo (Kinshasa)	339	35	--	--	--	--	--
Egypt[2]	4	4	4	14	14	14	14
South Africa	133	124	126	91	115	115	115
Zambia	438	328	227	398	500	800	800
Zimbabwe	14	7	10	7	6	6	6
Total	930	500	370	510	640	940	940

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Egypt produced secondary refined copper; primary production in all other African countries.

[3]Pilot plant production only.

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TABLE 9

AFRICA: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 1990-2011[1]

(Metal content in kilograms)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria	--	--	--	597	1,000	1,500	1,500
Benin	--	300	--	20	20	20	20
Botswana	46	86	4	162	3,000	3,000	3,000
Burkina Faso	7,800	1,319	625	1,125	3,900	3,900	3,900
Burundi	9	2,000	--	2,900	2,900	2,900	2,900
Cameroon[2]	10	800	1,000	1,500	1,500	1,500	1,500
Central African Republic	241	97	15	7	10	10	10
Chad	--	--	120	150	50	50	50
Congo (Brazzaville)	7	10	10	60	10	10	10
Congo (Kinshasa)	9,300	1,180	69	5,700	5,700	9,400	13,200
Cote d'Ivoire	20	1,983	3,444	1,219	1,200	1,200	1,200
Equatorial Guinea	50	50	500	500	500	500	500
Eritrea	--	59	264	33	40	13,200	840
Ethiopia	848	4,500	3,206	3,443	3,500	3,500	3,500
Gabon	80	70	70	70	70	70	70
Ghana	16,800	53,087	72,080	63,139	67,000	67,000	67,000
Guinea	6,340	7,863	15,788	10,700	16,000	16,000	16,000
Kenya	25	170	1,243	1,600	600	600	600
Liberia	600	800	25	20	20	20	20
Madagascar	216	38	5	5	800	1,000	1,000
Mali	5,200	3,996	28,717	37,974	55,000	31,500	31,500
Mauritania	--	1,196	--	--	3,400	5,200	5,200
Morocco	500	580	505	1,200	1,200	1,200	1,200
Mozambique	63	6,800	23	56	65	65	65
Namibia	1,610	2,394	2,417	2,205	2,500	2,500	2,500
Niger	--	1,000	25	684	700	700	700
Nigeria	--	5	52	30	30	30	30
Rwanda	2,160	26	10	--	--	--	--
Senegal	--	--	550	600	600	600	600
Sierra Leone	32	4	--	1,000	1,000	1,000	1,000
South Africa	605,000	523,809	430,800	340,500	303,000	312,000	302,000
Sudan	100	3,700	5,774	5,000	5,000	5,000	5,000
Tanzania	3,500	320	15,060	51,010	58,000	56,000	50,000
Uganda	--	1,506	56	178	1,500	1,500	1,500
Zambia	129	91	600	--	--	--	--
Zimbabwe	16,900	23,959	22,069	21,330	12,000	20,000	20,000
Total	678,000	644,000	605,000	555,000	552,000	563,000	538,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]From artisanal mining.

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TABLE 10

AFRICA: HISTORIC AND PROJECTED IRON ORE MINE PRODUCTION, 1990-2011[1]

(Fe content in thousand metric tons)

Country	Average grade[2]	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria	50%	1,470	1,100	820	710	800	800	800
Egypt	55%	1,330	1,120	1,900	2,000	2,000	2,000	2,000
Liberia	57% to 64%	2,490	--	--	--	--	--	--
Mauritania	59% to 72%	6,800	7,000	7,500	7,200	7,200	11,800	11,800
Morocco		90	32	4	5	5	5	5
Nigeria	36%	138	62	9	--	1,000	1,800	1,800
Senegal		--	--	--	--	--	--	3,800
South Africa	62% to 65%	19,800	19,800	21,570	24,800	26,300	33,300	40,700
Tanzania	32%	--	14	--	--	--	--	--
Tunisia	54%	154	122	98	128	100	100	50
Uganda	61% to 67%	--	--	3	--	--	--	--
Zimbabwe[3]		730	160	225	140	200	200	200
Total		33,000	29,400	32,100	35,000	37,600	50,000	61,200

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more that three significant digits.

[2]Direct shipping ore and concentrate.

[3]Average iron content for Zimbabwe prior to 1996 was 61%. Since 1996, the average grade has been 51%.

TABLE 11

AFRICA: HISTORIC AND PROJECTED IRON PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria[2]	1,046	940	1,100	1,300	1,300	1,300	1,300
Egypt:							
Pig iron	1,100	1,062	1,400	1,700	1,700	1,700	1,700
Direct-reduced iron	710	850	2,110	2,600	2,600	2,600	2,600
Libya[3]	500	963	1,500	1,580	1,600	1,600	1,600
Morocco[2]	15	15	15	15	15	15	15
Mozambique	--	--	--	--	--	200	200
Nigeria							
Pig iron	--	--	--	--	500	1,300	1,300
Direct-reduced iron	110	20	--	--	500	500	500
South Africa:							
Pig iron	6,893	6,055	6,300	6,011	6,460	6,810	6,810
Direct-reduced iron	1,067	1,262	1,526	1,633	1,960	1,960	1,960
Tunisia[2]	140	162	196	--	--	--	--
Zimbabwe[2]	521	209	277	150	200	200	200
Total	12,000	11,500	14,400	15,000	16,800	18,200	18,200

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more that three significant digits.

[2]Pig iron

[3]Direct-reduced iron.

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TABLE 12
AFRICA: HISTORIC AND PROJECTED STEEL PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria	836	827	842	1,014	1,700	1,700	1,700
Angola	10	--	--	--	--	--	--
Benin	8	--	--	--	--	--	--
Congo (Kinshasa)	NA	NA	159	130	130	130	130
Egypt	2,240	2,642	2,838	4,400	4,400	4,400	4,400
Kenya	20	20	--	--	--	--	--
Libya	492	909	1,055	1,026	1,300	1,300	1,300
Mauritania	NA	NA	5	5	5	5	5
Morocco	7	7	5	5	5	5	5
Nigeria	220	36	--	10	1,000	2,000	2,000
South Africa	8,620	8,741	8,481	9,504	10,900	11,300	11,300
Tunisia	177	201	237	70	--	--	--
Uganda	--	12	7	7	7	7	7
Zimbabwe	580	210	258	180	200	200	500
Total	13,200	13,600	13,900	16,400	19,600	21,000	21,300

[e]Estimated. NA Not available. -- Negligible or no production.
[1]Estimated data and totals are rounded to no more than three significant digits.

TABLE 13
AFRICA: HISTORIC AND PROJECTED LEAD MINE PRODUCTION, 1990-2011[1]

(Metal content in metric tons)

Country[2]	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria	1,100	1,383	818	--	300	300	300
Morocco	68,800	67,708	81,208	31,300	32,000	32,000	32,000
Namibia	18,000	16,084	11,114	14,338	12,000	12,000	10,000
Nigeria	NA	NA	165	200	200	200	200
South Africa	69,400	88,449	75,262	37,485	58,000	58,000	58,000
Tunisia	2,970	6,601	6,602	5,500	1,000	1,000	1,000
Total	160,000	180,000	175,000	89,000	104,000	104,000	102,000

[e]Estimated. NA Not available. -- Negligible or no production.
[1]Estimated data and totals are rounded to no more than three significant digits.
[2]Nigeria also mined small amounts of lead.

TABLE 14
AFRICA: HISTORIC AND PROJECTED PRIMARY REFINED LEAD PRODUCTION, 1990-2011[1]

(Metric tons)

Country[2]	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria	1,000	800	6,100	5,000	5,000	5,000	5,000
Morocco	64,000	59,673	66,812	35,000	35,000	35,000	35,000
Namibia	35,100	26,752	--	--	--	--	--
Total	100,000	87,200	72,900	40,000	40,000	40,000	40,000

[e]Estimated. -- Negligible or no production.
[1]Estimated data and totals are rounded to no more than three significant digits.
[2]Nigeria also refines a small quantity of primary lead.

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TABLE 15

AFRICA: HISTORIC AND PROJECTED SECONDARY REFINED LEAD PRODUCTION, 1990-2011[1]

(Metric tons)

Country[2]	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria	3,500	7,500	--	--	--	--	--
Kenya	2,400	2,000	1,000	1,000	1,000	1,000	1,000
Morocco	2,000	2,600	3,000	4,000	4,000	4,000	4,000
Nigeria	--	4,000	5,000	5,000	5,000	5,000	5,000
South Africa	31,200	32,100	46,200	64,100	64,000	64,000	64,000
Total	39,100	48,200	55,200	74,100	74,000	74,000	74,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Egypt and Uganda also refine small quantities of secondary lead.

TABLE 16

AFRICA: HISTORIC AND PROJECTED NICKEL MINE PRODUCTION, 1990-2011[1]

(Metal content in metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Botswana	23,200	18,088	38,420	35,820	38,000	38,000	20,000
Madagascar	--	--	--	--	--	59,000	59,000
Morocco	NA	NA	84	130	130	130	130
South Africa	29,000	30,700	36,616	39,853	41,000	52,000	52,000
Zimbabwe	13,500	11,721	8,160	9,776	10,000	5,000	15,000
Total	65,700	60,500	83,300	85,600	89,100	154,000	146,000

[e]Estimated. NA Not available. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

TABLE 17

AFRICA: HISTORIC AND PROJECTED PLATINUM MINE PRODUCTION, 1990-2011[1]

(Metal content in kilograms)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
South Africa	87,800	102,300	114,459	159,862	175,000	181,000	181,000
Zimbabwe	21	7	505	4,438	8,900	14,600	14,600
Total	87,800	102,000	115,000	164,000	184,000	196,000	196,000

[e]Estimated.

[1]Estimated data and totals are rounded to no more than three significant digits.

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TABLE 18

AFRICA: HISTORIC AND PROJECTED PALLADIUM MINE PRODUCTION, 1990-2011[1]

(Metal content in kilograms)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
South Africa	38,300	51,000	55,818	78,029	89,000	90,800	90,800
Zimbabwe	31	17	366	3,564	7,700	11,900	11,900
Total	38,300	51,000	56,200	81,600	96,700	103,000	103,000

[e]Estimated.

[1]Estimated data and totals are rounded to no more than three significant digits.

TABLE 19

AFRICA: HISTORIC AND PROJECTED ZINC MINE PRODUCTION, 1990-2011[1]

(Metal content in metric tons)

Country[2]	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria	4,160	7,174	10,452	231	3,500	5,000	5,000
Congo (Kinshasha)	61,800	4,500	--	--	--	--	--
Morocco	18,800	79,947	103,064	74,600	107,000	107,000	107,000
Namibia	37,700	30,209	39,126	66,028	65,000	65,000	65,000
South Africa	75,000	70,241	63,590	32,310	59,000	59,000	59,000
Tunisia	3,960	44,244	41,247	29,011	2,000	1,000	1,000
Total	201,000	236,000	257,000	202,000	237,000	237,000	237,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Nigeria also mined a small quantity of zinc.

TABLE 20

AFRICA: HISTORIC AND PROJECTED ZINC METAL PRODUCTION, 1990-2011[1]

(Metal content in metric tons)

Country[2]	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria	23,600	30,000	34,000	25,000	25,000	25,000	25,000
Congo (Kinshasha)	38,200	--	--	--	--	--	--
Namibia	--	--	--	120,533	150,000	150,000	150,000
South Africa	92,000	98,782	103,000	104,000	104,000	104,000	104,000
Total	154,000	129,000	137,000	250,000	279,000	279,000	279,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Nigeria also refined a small quantity of zinc.

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TABLE 21

AFRICA: HISTORIC AND PROJECTED DIAMOND MINE PRODUCTION, 1990-2011[1]

(Thousand carats)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Angola[2, 3]	1,130	2,900	4,313	6,100	10,700	10,700	10,700
Botswana	17,400	16,802	24,635	31,125	32,000	32,000	33,000
Cameroon	NA	NA	NA	12 [4]	12	12	12
Central African Republic	381	530	464	350	350	350	350
Congo (Brazaville)	NA	NA	50	50	50	50	50
Congo (Kinshasa)	19,400	22,024	16,006	30,880	30,600	32,100	32,100
Côte d'Ivoire	12	75	320	230	230	230	230
Gabon	1	1	1	1	1	1	1
Ghana	650	632	878	905	900	900	900
Guinea	127	365	327	740	800	800	800
Lesotho	NA	NA	2	4	290	300	300
Liberia	100	150	170	10	10	10	10
Namibia	763	1,382	1,552	2,004	2,100	2,200	2,300
Sierra Leone	78	214	77	692	700	700	700
South Africa	8,710	9,683	10,790	14,293	16,100	16,100	16,100
Tanzania	85	50	354	304	330	330	330
Zimbabwe	--	204	23	44	200	400	400
Total	48,800	55,000	60,000	87,700	95,400	97,200	98,300

[e]Estimated. NA Not available. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Does not include smuggled production.

[3]Production was about 90% gem and 10% industrial grade.

[4]From artisanal mining.

TABLE 22

AFRICA: HISTORIC AND PROJECTED PHOSPHATE ROCK PRODUCTION, 1990-2011[1]

(P_2O_5 content in thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria	333	500	265	240	310	300	300
Burkina Faso	NA	NA	NA	1	1	1	1
Egypt	286	207	317	650	650	650	650
Mali	2	1	--	--	--	--	--
Morocco	6,910	6,399	7,200	8,500	9,000	9,000	9,000
Senegal	823	556	626	576	720	900	900
South Africa	1,200	1,101	1,083	1,070	1,070	1,070	1,070
Tanzania	8	2	2	2	2	2	2
Togo	840	930	490	418	400	400	400
Tunisia	1,860	2,181	2,500	2,400	2,400	2,500	2,500
Zimbabwe	52	45	25	27	25	25	30
Total	12,300	11,900	12,500	13,900	14,600	14,800	14,900

[e]Estimated. NA Not available. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

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TABLE 23

AFRICA: HISTORIC AND PROJECTED SALABLE COAL, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Botswana	793	898	947	916	1,000	1,200	1700
Congo (Kinshasa)	100	10	--	1	1	1	1
Egypt	--	10	39	100	100	100	100
Malawi	41	15	34	41	96	96	96
Morocco	526	650	31	-- [2]	-- [2]	-- [2]	-- [2]
Mozambique	40	40	16	17	26	14,000	14,000
Niger	154	135	158	183	180	180	180
Nigeria	78	29	12	9	10	50	50
South Africa	175,000	206,210	224,118	242,747	258,000	266,000	266,000
Swaziland	151	172	178	550	550	550	550
Tanzania	52	43	79	65	65	1,600	1,600
Zambia	382	141	168	240	250	250	250
Zimbabwe[2]	5,500	5,538	3,809	2,476	2,500	2,500	4,000
Total	183,000	214,000	230,000	247,000	263,000	287,000	289,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Less than 1 unit.

TABLE 24

AFRICA: HISTORIC AND PROJECTED DRY NATURAL GAS PRODUCTION, 1990-2011[1]

(Million cubic meters)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria	48,500	58,100	100,092	98,111	120,000	125,000	130,000
Angola	538	560	560	--	--	--	--
Côte d'Ivoire	--	36	1,146	1,500	1,500	1,500	1,500
Egypt	7,900	12,536	21,000	18,000	18,000	16,000	14,000
Equatorial Guinea	--	--	98	1,390	1,400	1,400	1,400
Gabon	150	150	99	80	80	80	80
Ghana	--	--	--	112	100	100	100
Libya	6,200	6,345	5,900	7,000	7,500	7,500	8,000
Morocco	37	22	50	40	40	40	40
Mozambique	--	--	1	1,295	2,500	3,100	3,100
Nigeria	3,230	5,000	21,945	34,411	57,000	60,000	60,000
Senegal	110	110	56	13	13	13	13
South Africa	--	1,980	2,088	2,500	2,500	2,500	2,500
Tanzania	--	--	--	119	380	380	380
Tunisia	200	250	1,600	2,050	2,300	2,200	2,000
Total	66,900	85,100	155,000	167,000	213,000	220,000	223,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

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TABLE 25

AFRICA: HISTORIC AND PROJECTED CRUDE PETROLEUM, INCLUDING CONDENSATE, PRODUCTION, 1990-2011[1]

(Thousand 42-gallon barrels)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Algeria	444,000	438,730	476,288	604,000	600,000	620,000	620,000
Angola	174,000	232,800	273,000	361,715	438,000	438,000	438,000
Benin	1,416	654	--	--	--	--	--
Cameroon	64,600	39,400	32,100	34,675	35,000	35,000	35,000
Chad	--	--	--	61,400	84,000	84,000	80,000
Congo (Brazzaville)	58,800	63,875	100,375	82,069	80,000	80,000	70,000
Congo (Kinshasa)	10,600	10,087	8,500	10,100	10,100	10,100	10,100
Côte d'Ivoire	770	2,000	2,578	7,434	20,000	20,000	20,000
Egypt	319,000	335,800	285,000	219,000	210,000	210,000	200,000
Equatorial Guinea	--	2,300	43,029	125,000	125,000	125,000	125,000
Gabon	100,000	133,000	118,625	87,235	90,000	90,000	90,000
Ghana	--	--	2,555	3,000	3,000	3,000	3,000
Libya	502,000	509,175	538,000	587,000	600,000	600,000	650,000
Morocco	114	36	97	246	300	300	300
Nigeria	660,000	740,000	783,000	900,400	1,200,000	1,200,000	1,200,000
Senegal	8	2	1	--	--	--	--
South Africa	--	--	6,606	6,769	7,300	7,300	7,300
Sudan	--	730	67,152	118,000	280,000	265,000	250,000
Tunisia	36,500	32,690	28,207	25,700	18,000	17,000	16,000
Total	2,370,000	2,540,000	2,770,000	3,230,000	3,800,000	3,800,000	3,810,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

TABLE 26

AFRICA: HISTORIC AND PROJECTED URANIUM PRODUCTION, 1990-2011[1]

(Metal content in metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Gabon	702	653	--	--	--	--	--
Malawi	--	--	--	--	--	850	850
Namibia	3,214	2,006	2,714	3,038	3,200	3,000	3,000
Niger	2,681	2,970	2,898	3,282	3,300	3,300	3,300
South Africa	2,442	1,443	861	753	1,600	2,100	2,300
Total	9,000	7,100	6,500	7,100	8,100	9,300	9,500

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

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The Mineral Industry of Algeria

By Philip M. Mobbs

In 2004, hydrocarbons remained the leading component of Algeria's mineral industry and national economy. The mineral industry also produced modest amounts of diverse metals, industrial minerals, and mineral-based commodities, such as ammonia, clay, cement, helium, iron ore, mercury, methanol, phosphate rock, salt, and steel. The Algerian gross domestic product (GDP) based on purchasing power parity was $217.2 billion[1] in 2004 and the GDP per capita based on purchasing power parity was $6,722 (International Monetary Fund, 2005§[2]).

Trade

Most Algerian exports were shipped through the country's eight main seaports or by pipeline. The border with Morocco remained closed. The Société Nationale des Transports Ferroviaires moved about 25% of the imported cement inland from coastal ports. Hydrocarbon shipments transited primarily through the Ports of Arzew-Béthioua, Béjaïa, and Skikda. In 2004, total exports of goods and services from Algeria were valued at more than $34 billion and imports were valued at $21.8 billion. Exports of hydrocarbons were valued at more than $31.54 billion compared with about $24 billion in 2003. Exports of crude oil and condensate (petroleum liquids at surface pressure and temperature that were recovered as a coproduct of natural gas production) were valued at about $17.43 billion in 2004 compared with about $11.3 billion in 2003. Other Algerian hydrocarbon exports in 2004 included natural gas (by pipeline), with a value of about $4.74 billion; liquefied natural gas, (LNG), $3.74 billion; refined petroleum products, $3.04 billion; and liquefied petroleum gas, $2.59 billion (Banque d'Algeria, 2005§; Ministère de l'Energie et des Mines, 2005§).

Structure of the Mineral Industry

Nonfuel mineral operations fell under Mining law No. 01-10 of July 3, 2001, and Decree No. 02-65 of June 2, 2002. A proposed new hydrocarbon law that would alter the relationship between Government-owned oil and gas company Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures s.p.a. (Sonatrach) and the oil industry was reintroduced in late 2004; the original bill had been withdrawn in 2003 pending Government elections in early 2004. The original version would have eliminated Sonatrach's monopoly on pipeline and refining operations, removed the requirement that Sonatrach acquire 50% interest in oilfield projects, and transferred exploration and production licensing to a yet-to-be-formed Government organization (Nield, 2005).

Subsidiary companies of the Ministère de l'Energie et des Mines were involved in most mineral production. In the nonfuel mineral sector, private companies and local government enterprises ran cement, clay, gold, gypsum, helium, iron ore, marble, salt, sand, steel, and stone operations. International oil companies operated primarily under contract to Sonatrach.

Commodity Review

Metals

Gold.—Enterprise d'Exploitation des Mines d'Or s.p.a. (ENOR) mined ore at Tirek and at Amesmessa, which is located about 60 kilometers (km) south of Tirek. In 2004, GMA Resources Plc of the United Kingdom, which held 52% interest in ENOR, proposed to build a 300,000-metric-ton-per-year (t/yr) processing plant at Amesmessa. Completion of the feasibility study for the proposed plant was expected in August 2005. GMA reported that a drill program at Amesmessa was completed. Based on the drilling results, the Amesmessa prospect was reevaluated as an open pit operation. ENOR originally planned to develop the deposit as an underground mine (GMA Resources Plc, 2005).

Lead, Silver, and Zinc.—By early 2004, ore production from the El Abed lead-zinc and the Kherzet Youcef zinc mines had ended. The Enterprise Nationale des Produits Miniers Non-Ferreux et des Substances Utiles, s.p.a. (ENOF) proposed to develop additional zinc resources at the Kherzet Youcef Mine and to renew efforts to develop the zinc resources at Oued Amizour. In 2003, the Ministère de l'Energie et des Mines proposed to convert the underground El Abed lead-zinc mine and surface facilities into a mining school.

Mercury.—ENOF suspended mercury production in June. Rehabilitation of the facilities at Ismail and M'Rasma continued at yearend (Mining Journal, 2004).

Industrial Minerals

Cement.—In January, Algerian Cement Co. awarded the contract for a second 2.2-million-metric-ton-per-year (Mt/yr)-capacity cement line at the M'Sila facility to FL Smidth of Denmark and ORASCOM Construction Industries Algeria. Algerian Cement started its first 2.2-Mt/yr cement kiln in March (Middle East Economic Digest, 2004).

Nitrogen, Phosphate, and Sulfur.—Ammonia production dipped in 2004 when the Alzofert plant of the ASMIDAL Group was closed for a months-long maintenance program. Also in 2004, the Enterprise Nationale du Fer et du Phosphate s.p.a. (FERPHOS) requested bids on a feasibility study for a proposed fertilizer facility at Jijel. Plants planned for the FERPOHS facility included a 9,600-metric-ton-per-day (t/d)-capacity

[1]Where necessary, currency values have been converted from Algerian dinars (DA) to U.S. dollars (US$) at the average rate of DA74.15=US$1.00 for 2004.

[2]References that include a section mark (§) are found in the Internet References Cited section.

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sulfuric acid plant, a 6,000-t/d ammonia plant, a 3,000-t/d diammonium phosphate plant, and a 1,000-t/d phosphoric acid plant (Enterprise Nationale du Fer et du Phosphate s.p.a., 2003, 2004§).

Mineral Fuels

Natural Gas.—On January 19, 2004, an explosion destroyed three LNG trains at the Sonatrach facility at Skikda and damaged the remaining trains. One of the damaged 1-billion-cubic-meter-per-year-capacity trains resumed production in May. A second train was ready to resume production at yearend. The third was expected to resume operations in mid-2005. Sonatrach proposed to replace the destroyed LNG trains at Skikda with a single more-than-4-billion-cubic-meter-per-year-capacity LNG train. Sonatrach initiated plans to build a 4-billion-cubic-meter-per-year-capacity LNG train at Arzew as part of the Gassi Touil Integrated Gas Project (Africa Energy Intelligence, 2005; Middle East Economic Digest, 2005).

The joint venture of BP p.l.c., Sonatrach, and Statoil ASA began production of natural gas from the In Salah project in June. Initial delivery of gas through a 460-km pipeline to the Sonatrach gas-gathering center at Hassi R'Mel began in July and reached a flow rate of about 9 billion cubic meters per year by yearend (Rigzone.com, 2004§).

The Ministère de l'Energie et des Mines proposed to eliminate flaring of natural gas associated with oil production by 2010. In 2003, the last year for which data were available, about 11% of the associated gas in Algeria was flared (Energie & Mines, 2004).

Algeria's natural gas reserves were about 4.55 trillion cubic meters, which ranked the country eighth in the world (BP p.l.c., 2005, p. 20).

Outlook

Owing to its location close to Europe (which was the major market for its minerals) and its hydrocarbon resources and associated infrastructure, Algeria's hydrocarbon sector is expected to continue to be a magnet for foreign direct investment, although with the recent lifting of economic sanctions, neighboring Libya is expected to siphon off some oilfield investment interest. Additional natural gas production projects that are under development in Algeria include the In Amenas project (production expected in 2005) and the Gassi Touil project (2007) (Medjelled, 2004).

References Cited

Africa Energy Intelligence, 2005, Algeria—Gas projects for 2005: African Energy Intelligence, no. 384, January 5, p. 3.

BP p.l.c., 2005, Statistical review of world energy: London, United Kingdom, BP p.l.c., June, 41 p.

Energie & Mines, 2004, Algeria commits to eliminate gas flaring by 2010: Energie & Mines, no. 3, November, p. 141.

Enterprise Nationale du Fer et du Phosphate s.p.a., 2003, Call for expression of interest: Tébessa, Algeria, Enterprise Nationale du Fer et du Phosphate s.p.a., October 21, 3 p.

GMA Resources Plc, 2005, Significant mining opportunity identified for new project at Amesmessa: London, United Kingdom, GMA Resources Plc, March 14, 3 p.

Medjelled, M., 2004, A huge opportunity: Energie & Mines, no. 2, April, p. 62-63.

Middle East Economic Digest, 2004, ACC signs cement expansion: Middle East Economic Digest, v. 48, no. 5, January 30, p. 19.

Middle East Economic Digest, 2005, Selected Middle East oil & gas projects: Middle East Economic Digest, v. 49, no. 2, January 14, p. 49.

Mining Journal, 2004, Minor metals suffer September setbacks—Mercury: London, United Kingdom, Mining Journal, October 1, p. 4-5.

Nield, Richard, 2005, Unlocking potential: Middle East Economic Digest, v. 49, no. 14, April 8, p. 4-5.

Internet References Cited

Banque d'Algeria, 2005, Indicateurs monetaires et financiers, 1er trimester 2005, accessed September 2, 2005, at URL http://www.bank-of-algeria.dz/omdocateir.htm.

Enterprise Nationale du Fer et du Phosphate s.p.a., 2004 (June 28), Appels d'offres, accessed September 2, 2005, at URL http://www.ferphos.com/appels-offres.htm.

International Monetary Fund, 2005 (April), Algeria, World Economic Outlook Database, accessed May 3, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

Ministère de l'Energie et des Mines, 2005, Results of the energy and mining sector for year 2004, accessed March 24, 2005, via http://www.mem-algeria.org/statistics/results-2004.pdf.

Rigzone.com, 2004 (July 21), Statoil says gas deliveries have begun from In Salah project, accessed July 22, 2004, at URL http://www.rigzone.com/news/article.asp?a_id=14915.

Major Sources of Information

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TABLE 1
ALGERIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2, 3]		2000	2001	2002	2003	2004[p]
METALS						
Cadmium, refined[e]		10	10	8 [r]	5 [r]	--
Gold	kilograms	--	300	369	365	597
Iron and steel:						
Iron ore, gross weight	thousand metric tons	1,645	1,291	1,202	1,378	1,414
Metal:						
Pig iron[e]	do.	1,100	1,250	1,300	1,300	1,300
Steel, crude	do.	842	850 [e]	1,091	1,051	1,014
Lead:						
Concentrate, Pb content		818	891	1,105	-- [r]	--
Metal, refined[e]		6,100	6,000	6,000	6,100	5,000
Mercury	kilograms	215,625	320,091	307,119	175,600 [r]	90,000
Silver[e]	do.	1,400	1,700	1,400 [r]	500 [r]	100
Zinc:						
Concentrate, Zn content		10,452	10,693	8,576	2,796 [r]	231
Metal, smelter output[e]		34,000	34,000	26,136 [4]	32,200	25,000
INDUSTRIAL MINERALS						
Barite, crude		51,925	43,020	51,773	45,649	47,945
Cement, hydraulic[e, 5]	thousand metric tons	8,300	8,300	9,000	9,000	9,000
Clays:						
Bentonite		22,708	21,286	27,178	25,346	30,319
Fuller's earth		3,431	3,254	3,521	2,573	2,284
Kaolin		11,616	13,356	9,505	16,591	24,299
Diatomite		2,500 [e]	2,863	3,185	2,595	2,665
Feldspar		707	--	--	--	--
Gypsum[6]	thousand metric tons	1,341	281	322	350	300
Lime, hydraulic[e]		96,000	100,000	100,000	100,000	100,000
Marble						
Blocks	thousand cubic meters	25	33	23	24	22
Crushed stone		81,907	109,872	108,682	105,249	120,666
Slabs	thousand square meters	250	224	215	180	99
Nitrogen, N content of ammonia[7]		457,900	482,000 [r]	563,100	578,200	542,800
Phosphate rock:						
Gross weight	thousand metric tons	877	939	740	905	805
P_2O_5 content[e]	do.	265	280	230	280	240
Pozzolan[e]		360,000	421,238 [r, e]	451,000	500,000	436,000
Salt, brine and sea salt		182,000	184,682	205,321	191,017	183,000
Sand	thousand cubic meters	200	209	392	495	585
Sulfur, S content of sulfuric acid[e]		11,800	7,200	19,300	20,000	20,000
MINERAL FUELS AND RELATED MATERIALS						
Coke	thousand metric tons	409	441	450 [e]	450 [e]	400
Gas, natural:						
Gross	million cubic meters	139,499	140,740	139,998	137,634	144,281
Dry[8]	do.	100,092	102,332	101,557	98,754	98,111
Helium, liquid[e]	do.	10	16	17	19	15
Methanol		NA	94,030	91,470	115,690	107,360
Natural gas plant liquids	thousand 42-gallon barrels	95,619	99,800	100,850	98,100	98,500
Petroleum:						
Crude, including condensate	do.	476,288	464,600	499,890	580,000	604,000
Refinery products:						
Liquefied petroleum gas	do.	6,322	6,600	6,870	7,050	6,650
Gasoline	do.	17,964	17,390	16,540	16,150	16,420
Naphtha	do.	32,124	34,370	33,690	34,230	25,450
Kerosene and jet fuel	do.	12,458	11,510	10,770	10,170	7,820
Distillate fuel oil	do.	44,820	49,790	45,100	46,150	43,000
Lubricants	do.	770	790	875	980	1,130
Residual fuel oil	do.	36,803	42,930	38,850	41,150	37,130
Other	do.	3,044	2,850	2,690	2,120	2,350
Total	do.	154,305	166,230	155,385	158,000	139,950

See footnotes at end of table.

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TABLE 1--Continued
ALGERIA: PRODUCTION OF MINERAL COMMODITIES[1]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary.
[r]Revised. NA Not available. -- Zero.
[1]Table includes data available through September 6, 2005.
[2]In addition to the commodities listed, secondary aluminum, secondary lead, and secondary copper may be produced in small quantities; crude construction materials for local consumption, and copper, fertilizer, marble slabs, methanol, perlite, urea, and volcanic tuff are produced, but available information is inadequate to make estimates of production levels.
[3]In addition to the commodities listed, about 700 metric tons per year of caustic soda is estimated to have been produced.
[4]Reported figure.
[5]Erroneous cement units (metric tons instead of thousand tons) were used in previous Algeria production tables published during the period 1997 to 2000.
[6]Includes about 50,000 metric tons per year of plaster.
[7]Additional nitrogen was produced by Helios s.p.a., which is a helium liquids production company.
[8]Excludes gas used in flaring, reinjection, transmission losses, and venting.

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The Mineral Industry of Angola

By Omayra Bermúdez-Lugo

The Republic of Angola, which is located in southern Africa, is bordered by the Atlantic Ocean to the west, Namibia to the south, the Democratic Republic of the Congo to the northeast, and Zambia to the east. In 2004, the population was estimated to be about 11 million and was growing at an estimated rate of about 1.93%. The country's total land area is about 1,246,700 square kilometers (km^2), which is an area comparable to slightly less than twice the size of Texas, and includes the enclave of Cabinda in the Democratic Republic of the Congo (U.S. Central Intelligence Agency, 2004§[1]). The International Monetary Fund (2005§) estimated Angola's gross domestic product (GDP) based on purchasing power parity to be about $36.8 billion in 2004 and the per capita GDP based on purchasing power parity to be about $2,457 for the same period (International Monetary Fund, 2005, p. 5). Angola's mineral industry was dominated by diamond and petroleum production. In 2003, diamond production accounted for about 95% of nonfuel exports and for about 10% of the nonfuel GDP. Petroleum production accounted for about 75% of Government revenue (International Monetary Fund, 2005, p. 5, 8).

Government Policies and Programs

In 2004, Angola continued to recover from 27 years of civil war. United Nations sanctions on the National Union for the Total Independence of Angola (UNITA) rebel movement were lifted in December 2002 following the signing of the Luena Memorandum of Understanding, which formalized the cease-fire agreement that prevailed after the death of UNITA's leader in January 2002 (U.S. Department of State, 2005§). The Front for the Liberation of the enclave of Cabinda, however, continued to be engaged in guerilla attacks against Government targets and to kidnap foreigners in an effort to press for the independence of Cabinda. National elections will be held in 2006 (U.S. Department of State, 2005§).

In February 2004, Angola formally adhered to the African Evaluation Mechanism by Pairs of the New Partnership for the Development of Africa (NEPAD). The NEPAD is a self-evaluation mechanism that focuses on African Union member states' performances in the fields of sustained cultural, economic, political, and social good governance, and aims to ensure that the policies and actions of the countries that adhere to it are in conformity with the African Union codes, standards, and values (Permanent Mission of Angola to the United Nations, 2004§). According to the U.S. Department of State (2005§), the Government of Angola estimated that about 4.7 million people were internally displaced by the civil war and that since 2002, about 300,000 of the country's 450,000 refugees had returned to Angola.

The Ministério de Geologia e Minas is the Government entity responsible for the negotiation of mineral rights contracts, for ensuring the application of mining laws, and for conducting geologic surveys. All mineral rights in Angola belong to the State and all mining and prospecting contracts must be approved by the Council of Ministers (The Diamonds and Human Security Project, 2004, p. 3). Corpo Especial de Fiscalização y Segurança de Diamantes was the Government agency accountable for oversight of the diamond sector; responsibilities included gathering intelligence and tracking exploration, mining, and sales activities of companies in the Angolan diamond industry (The Diamonds and Human Security Project, 2005, p. 3). Empresa Nacional de Diamantes de Angola E.P. (Endiama), which was the Government-owned diamond company, was responsible for administrating and regulating the diamond sector and was a partner in all diamond ventures. Endiama's subsidiaries included Sociedade de Comercialização de Diamantes de Angola (Sodiam), which was in charge of the marketing, sale, and trade of all diamond produced in Angola and the entity responsible for Kimberley Process compliance; and Endiama Prospeção e Produção S.A.R.L., which oversaw all Endiama's mining and prospecting interests. Sociedade Nacional de Combustíveis de Angola (Sonangol) was the Government-owned company responsible for petroleum exploration and production.

New institutional reforms in the diamond sector were introduced in 2004 and included a Government pledge to recapitalize Endiama and the creation of a new subsidiary for Endiama to develop mining ventures in its own right. As part of the sector's reorganization, the Government planned to put an end to informal diamond mining by incorporating artisanal miners into groups that would operate under licenses issued by Endiama. Other measures included the adoption of Decree No. 36/03 of June 27, 2003, under which all alluvial diamond licenses were to be authorized by the Ministry of Geology and Mining and all kimberlite mining projects were to be authorized by the Council of Ministers (International Monetary Fund, 2005, p. 23).

Structure of the Mineral Industry

The major foreign companies that operated joint ventures with Endiama in the diamond sector were Almazy Rossii-Sakha Joint Stock Company (ALROSA) of Russia, Bermuda-Registered ITM Mining Ltd. (ITM), the Leviev Group of Israel, Odebrecht Mining Services Inc. (Odebrecht) of Brazil, Petra Diamonds Ltd. of South Africa, and Trans Hex Group Ltd. of South Africa. The major international companies that operated in the petroleum sector included BP p.l.c., ChevronTexaco Corp., Exxon Mobil Corp., Norsk Hydro ASA, and Total S.A.

In 2004, Sodiam opened offices in Antwerp and Tel Aviv that served as the country's official uncut diamond export sales sites.

[1]References that include a section mark (§) are found in the Internet References Cited section.

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Sodiam planned to open additional offices in Dubai, China, and New York in 2005 (The Diamonds and Human Security Project, 2005, p. 5).

Trade

According to the U.S. Census Bureau, Angola's exports to the United States were valued at $4.52 million in 2004 compared with $4.27 million in 2003 and included $4.3 million of crude petroleum (U.S. Census Bureau, 2005b§). Imports from the United States were valued at about $594,000 in 2004 compared with about $491,000 in 2003. These included nearly $366,000 of drilling and oilfield equipment (U.S. Census Bureau, 2005a§). About 6 million carats of diamond were exported in 2003 at a value of $814 million compared with 5 million carats in 2002 at a value of $644 million (Kimberley Process, 2004§).

Commodity Review

Industrial Minerals

Diamond.—In addition to the Endiama joint ventures with foreign companies, which included ALROSA, ITM, the Leviev Group, Odebrecht, Petra Diamonds, and Trans Hex, diamond also was produced by artisanal miners. The International Monetary Fund (2005, p. 23) estimated that prior to 2003, between 250,000 and 400,000 artisanal miners worked in Angola and produced, at times, about one-third of Angola's diamond output.

Sociedade Mineira de Catoca Ltda. (SMC), which was the country's leading diamond producer, owned Catoca Mine. SMC was a joint venture among Endiama (32.8%), ALROSA (32.8%), the Leviev Group (18%), and Odebrecht (16.4%). In 2004, Catoca Mine produced about 3.6 million carats. SMC reported that it had invested more than $51 million to increase production capacity to about 8 million metric tons per year (Mt/yr) of ore by mid-2005. Reserve estimates at Catoca were reported to be 271 Mt of ore containing about 190 million carats of diamond (Sociedade Mineira de Catoca Ltda., 2005, p. 7-9, 29). Diamond production from Catoca Mine was sold to International Diamond Industries of Israel (The Diamonds and Human Security Project, 2004, p. 5).

Sociedade de Desenvolvimento Mineiro (SDM) operated the Luzamba project, which is located in Cuango Valley. The Luzamba project hosted the single largest alluvial operation in Angola. SDM, which was a 50/50 joint venture between Endiama and Odebrecht, planned to develop another alluvial deposit at Muanga in southern Cuango Valley in 2005 (The Diamonds and Human Security Project, 2004, p. 5; 2005, p. 6).

Energem Resources Inc. of Canada (formerly DiamondWorks Ltd.) held 48% interest in a joint venture with ALROSA and Espiritu Santo Bank of Portugal. The joint venture held 80% interest in the alluvial diamond deposits and 100% interest in five kimberlite pipes that were located on the Luo diamond concession. The concession was on care and maintenance status in 2004. During the year, Energem renegotiated commercial terms with the Government and sought additional exploration opportunities in the country (Energem Resources Inc., 2004, p. 12-13).

SouthernEra Diamonds Inc. of Canada in joint venture with Endiama and Welox Ltd. of Israel continued to await Government approval for the establishment of a limited-liability company under the name of Sociedade Mineira do Camafuca Lda. The joint venture planned to develop the primary kimberlite deposits associated with the Camafuca-Camazamba kimberlite pipe, which is located in Lunda Norte Province in northwestern Angola about 20 km southeast of the town of Lucapa. SouthernEra estimated total inferred mineral resources to be about 210 million cubic meters at an average grade of 0.111 carat per cubic meter containing about 23 million carats of diamond (SouthernEra Diamonds Inc., 2005, p. 8-9; SouthernEra Diamonds Inc., 2004§).

In December 2004, Petra Diamonds Limited signed a joint-venture agreement with BHP Billiton World Exploration Inc. for the development of the Alto Cuilo diamond project, which is located in northeastern Angola about 700 km southeast of Luanda. BHP could acquire a 75% interest in the project with an investment of $60 million. Petra, through its wholly owned subsidiary Petra Diamonds Alto Cuilo Limited (PDAC), held a 36% interest in the Alto Cuilo kimberlite exploration agreement and a 38% interest in the Alto Cuilo alluvial exploration agreement in partnership with Endiama and Organizações Moyoweno, an Angolan company. Petra's other interests in Angola included the Medio Kwanza concession, which is located west of Alto Cuilo, and the Muriege concession, which is located east of Alto Cuilo (Petra Diamonds Limited, 2005, p. 7-8; Petra Diamonds Limited, 2004§).

Trans Hex held a 35% interest in Luarica Mine and a 32% interest in Fucauma Mine, both of which are located in northeastern Angola. Luarica Mine, which began production in 2003, produced 95,000 carats of diamond in 2004. The company planned to upgrade the plant at Luarica and to increase production capacity to 14,000 carats per month by 2006 at a cost of $6 million. The Fucauma operation was in pilot production during 2004 with commissioning of the plant scheduled for 2005. The plant at Fucauma will have a production capacity of 10,000 carats per month. Trans Hex also held interest in the Gango and the Luana exploration concessions. Gango was at an early exploration stage with bulk sampling of the kimberlite expected by the third quarter of 2005. At Luana, dredge sampling was completed in 2004, and evaluation bulk sampling was expected by the third quarter of 2005 (Trans Hex Group Ltd., 2005, p. 13, 16).

Mineral Fuels

Petroleum and Natural Gas.—Petroleum is produced offshore the enclave of Cabinda, offshore in the Kwanza Basin north of Luanda, offshore the country's northern coast, and onshore around the city of Soyo. According to Sonangol (2005b§), more than 200 exploration and appraisal wells have been drilled in Angola since 1990. Deepwater exploration began in 1991 with the leasing of Block 16, followed by the leasing of Blocks 14, 15, 17, 18, and 20. As of the beginning of 2000, a total of 29 offshore and onshore blocks had been licensed to 30 companies; the first floating production, storage, and offloading rig came online in August 2004.

Production from Block 0, which is located adjacent to the Cabinda coastline, accounted for about 70% of the country's

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total petroleum production. Average output in Block 0 was 600,000 barrels per day (bbl/d) (Sonangol E.P., 2005a§). ChevronTexaco was the operator of the block. In 2004, the company renewed the rights to the concession for an additional 20 years. Block 0 was divided into areas A and B. In 2004, production from Area A was 248,000 bbl/d of crude petroleum and 4,000 bbl/d of liquefied petroleum gas. In Area B, production averaged 119,000 bbl/d of crude petroleum. Block 14 was ChevronTexaco's second concession in Angola. In 2004, production averaged 57,000 bbl/d of crude petroleum. During the year, ChevronTexaco negotiated an extension to the exploration period for Block 14 and was planning a three-dimensional seismic program to assess the remaining potential of the block (ChevronTexaco Corp., 2005§).

Sonangol planned to construct a gas-condensate facility to produce liquefied petroleum gas; the facility was scheduled to come online in 2008 (Sonangol E.P., 2005b§). In addition, Sonangol planned to build a new refinery (Sonaref) in the city of Lobito, Benguela, which is located about 500 km south of Luanda, at a cost of $3.7 billion and a $3 billion liquefied natural gas plant in Soyo, which is located about 300 km north of Luanda. Sonaref will have a production capacity of 200,000 bbl/d and was expected to come onstream in 2008. The construction of Sonaref was expected to complement the production of Angola's existing refinery in Luanda and reduce Angola's exports of crude petroleum and crude natural gas (Sonangol E.P., 2005a§).

ExxonMobil held interest in five deepwater blocks in Angola. In 2004, the company announced its 17th petroleum discovery on Block 15, its 4th petroleum discovery on Block 31, and its 2d petroleum discovery on Block 32 In Block 15, the discovery well tested at a flowrate of 2,726 bbl/d of petroleum, and in Block 32, the discovery well tested at a rate of 6,800 bbl/d of petroleum. ExxonMobil's subsidiary Esso Exploration Angola (Block 15) Limited was the operator of Block 15 and held a 40% interest in the project. The remaining interest was shared by BP Exploration (Angola) Limited (26.67%), ENI Angola Exploration B.V. (20%), and Statoil Angola (13.33%). BP Exploration (Angola) Limited was the operator of Block 31 and held 26.67% interest in the block; Esso Exploration Angola (Block 31) Limited, Sonangol, and Statoil Angola held the remaining 25%, 20%, and 13.33% interests, respectively. TEPA Limited was the operator of Block 32 and held a 30% interest in the block; the remaining interest was held by Marathon Petroleum Angola (Block 32) Limited (30%), Sonangol (20%), Esso Exploration and Production Angola (Overseas) Limited (15%), and Petrogal Exploração (5%) (Exxon Mobil Corp., 2004b, c, d; 2005, p. 14).

In August 2004, ExxonMobil announced the beginning of production at its $3.4 billion Kizomba A project. Kizomba A is located about 370 kilometers northwest of Luanda and is the first of three production developments on Block 15 that are expected to yield collectively about 2.5 billion barrels of petroleum. The company reported estimated recoverable resources at Kizomba A as 1 billion barrels of gross petroleum with an expected production rate of about 250,000 bbl/d (Exxon Mobil Corp., 2004a).

References Cited

Energem Resources Inc., 2004, Yearend report—November 30, 2004: Vancouver, British Columbia, Canada, Energem Resources Inc., 25 p.

Exxon Mobil Corp., 2004a, ExxonMobil affiliate begins production in West Africa's largest deepwater development: Irving, Texas, Exxon Mobil Corp. press release, August 11, 1 p.

Exxon Mobil Corp., 2004b, ExxonMobil Angola subsidiary announces seventeenth deepwater discovery on Angola Block 15: Irving, Texas, Exxon Mobil Corp. press release, March 2, 1 p.

Exxon Mobil Corp., 2004c, ExxonMobil announces Canela discovery in deepwater Angola Block 32: Irving, Texas, Exxon Mobil Corp. press release, April 20, 1 p.

Exxon Mobil Corp., 2004d, ExxonMobil announces Venus discovery in deepwater Angola Block 31: Irving, Texas, Exxon Mobil Corp. press release, June 9, 1 p.

Exxon Mobil Corp., 2005, 2004 summary annual report: Irving, Texas, Exxon Mobil Corp., 50 p.

International Monetary Fund, 2005, Selected issues and statistical appendix: Washington DC, International Monetary Fund Country Report No. 05/125, February 25, 2005, 73 p.

Petra Diamonds Limited, 2005, 2004 annual report: St. Helier, Jersey, Channel Islands, Petra Diamonds Limited, 22 p.

Sociedade Mineira de Catoca Ltda., 2005, 2004 annual report: Luanda, Angola, Sociedade Mineira de Catoca Ltda., 43 p.

SouthernEra Diamonds Inc., 2005, 2004 annual report: Toronto, Ontario, Canada, SouthernEra Diamonds Inc., 16 p.

The Diamonds and Human Security Project, 2004, 2004 diamond industry annual review: Ottawa, Ontario, Canada, The Diamonds and Human Security Project, 12 p.

The Diamonds and Human Security Project, 2005, 2005 diamond industry annual review: Ottawa, Ontario, Canada, The Diamonds and Human Security Project, 12 p.

Trans Hex Group Ltd., 2005, 2005 annual report: Cape Town, South Africa, Trans Hex Group Ltd., 76 p.

Internet References Cited

ChevronTexaco Corp., 2005, Angola fact sheet, accessed December 13, 2005, at URL http://www.chevron.com/operations/docs/angola.pdf.

International Monetary Fund, 2005 (September), Angola, World Economic Outlook Database, accessed December 13, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.

Kimberley Process, 2004, Chair's report to plenary, Kimberley Process Plenary Meeting, Gatineau, Canada, 27-29 October 2004, accessed December 21, 2005, at URL http://www.kimberleyprocess.com:8080/site/www_docs/plenary_meetings20/chair_report_to_plenary.pdf.

Permanent Mission of Angola to the United Nations, 2004, Angola adheres to the NEPAD evaluation mechanism, accessed December 21, 2005, at URL http://www.un.int/angola/press_release_nepad.htm.

Petra Diamonds Limited, 2004, Angola, Country Profile, accessed December 22, 2005, at URL http://www.petradiamonds.co.za.

Sonangol E.P., 2005a, Corporate strategies, accessed December 28, 2005, at URL http://www.sonangol.co.ao/sonangolEP/strategy_en.shtml.

Sonangol E.P., 2005b, History of the oil industry in Angola, accessed December 13, 2005, at URL http://www.sonangol.co.ao/sonangolEP/historyOil_en.shtml.

SouthernEra Diamonds Inc., 2004, Camafuca diamond project, accessed December 22, 2005, at URL http://www.southernera.com/operations/camafuca.html.

U.S. Census Bureau, 2005a, U.S. exports to Angola from 2000 to 2004 by 5-digit end-use code, accessed December 21, 2005, at URL http://www.census.gov/foreign-trade/statistics/product/enduse/exports/c7620.html.

U.S. Census Bureau, 2005b, U.S. imports from Angola from 2000 to 2004 by 5-digit-end-use code, accessed December 21, 2005, at URL http://www.census.gov/foreign-trade/statistics/product/enduse/imports/c7620.html.

U.S. Central Intelligence Agency, 2004, Angola, World Factbook 2004, accessed December 13, 2005, at URL http://www.geoplace.com/hottopics/CIAwfb/factbook/geos/ao.html.

U.S. Department of State, 2005 (December), Angola, Background Note, accessed December 20, 2005, at URL http://www.state.gov/r/pa/ei/bgn/6619.htm.

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TABLE 1

ANGOLA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		2000	2001	2002	2003	2004
INDUSTRIAL MINERALS						
Cement:						
Hydraulic	thousand metric tons	511 [r, 2]	550 [r, 2]	597 [r, 2]	700 [r, e]	740 [e]
Clinker	do.	402 [2]	480 [2]	452 [2]	480 [e]	480 [e]
Diamond[3, 4]	thousand carats	4,313	5,159	5,022	5,700 [r]	6,100
Granite[e]	thousand cubic meters	1,500	1,500	1,500	1,500	1,500
Marble[e]	do.	100	100	100	100	100
Salt[e]	metric tons	30,000	30,000	30,000	30,000	30,000
MINERAL FUELS AND RELATED MATERIALS						
Petroleum:						
Crude	thousand 42-gallon barrels	273,000	270,100	329,600	321,200	361,715
Refinery products[e, 5]	do.	14,000	14,000	14,000	14,000	14,000
Gas, natural:						
Gross[6]	million cubic meters	11,613	-- [2]	--	-- [2]	--
Dry	do.	560	-- [2]	--	-- [2]	--
Liquefied petroleum gas	thousand 42-gallon barrels	1,626	--	--	-- [2]	--

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised -- Zero.

[1]Includes data available through November 2005.

[2]Reported.

[3]Does not include smuggled production.

[4]Production was approximately 90% gem and 10% industrial grade.

[5]Includes asphalt and bitumen.

[6]Angola has no natural gas distribution system. Most gas was vented and flared.

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The Mineral Industries of Benin, Burkina Faso, and Sao Tome e Principe

By Omayra Bermúdez-Lugo

BENIN

Benin is a West African country bounded by Togo to the west, Burkina Faso and Niger to the north, Nigeria to the east, and the Bight of Benin to the south. The country's estimated 7.25 million inhabitants shared a total land area of 112,620 square kilometers (km^2) (U.S. Central Intelligence Agency, 2005§[1]). In 2004, Benin's economy was primarily based on agriculture; cotton accounted for 80% of export earnings and about 40% of the gross domestic product (GDP) (U.S. Department of State, 2005a§). The mineral industry, which was limited to the production of cement, clay, gold, and sand and gravel, was not a significant component of Benin's economy. The GDP based on purchasing power parity was estimated to be $7.92 billion in 2004 (International Monetary Fund, 2005§).

Government Policy and Legislation

The Ministère des Mines, de l'Energie, et de l'Hydraulique was responsible for the administration of the mining sector. The Office Béninois de Recherches Géologiques et Minières was responsible for the administration of mineral development. The Benin Mining Code is regulated by Decree 89-296. Act No. 83-004 addresses fiscal policies that affect mineral development, and law No. 98-030 is responsible for national environmental responsibilities (Crankshaw, 2004).

In June 2004, Benin and China signed five agreements on economic and technological cooperation that included the granting of a preferential loan to Benin for the construction of a hydroelectric plant at the Adjarala dam project on the Mono River and the signing of a cooperation agreement between the China Council for the Promotion of International Trade and the Chamber of Commerce and Industry of Benin (Investir en Zone Franc, 2004§; People's Daily Online, 2004§).

In 2004, South Africa's Vice President visited Benin to follow up on an economic and political bilateral cooperation agreement that the two countries had signed in 2003. The areas of interest discussed were food processing, information and communication technology, tourism, transportation and infrastructure development, and the possibility of Benin supplying South Africa with agricultural products, cement, and cotton (afrolNews, 2004b§).

Trade

Benin's cotton exports and reexports to Niger and Nigeria accounted for about two-thirds of Benin's goods and services exports. About 90% of Benin's trade passes through the Port of Cotonou. The country's principal trading partner was Nigeria. In 2004, Nigeria banned imports of Beninese reexports and tightened its border controls citing Benin's lack of concern for Nigeria's claims regarding gasoline smuggling and the flourishing trade in Nigerian stolen goods (Organisation for Economic Co-operation and Development, 2005§; UN Office for the Coordination of Humanitarian Affairs, 2004§).

Commodity Review

Metals

Gold.—Gold was produced by artisanal miners from gold veins near the villages of Kwatena and Tchantangou, in the Atakora Mountains in northwestern Benin, and from alluvial sediments along the Perma River and its tributaries. Although gold had been mined in this region since colonial times, the Government did not become engaged in gold exploration until the 1960s. Exploration efforts were abandoned by the Government in the mid 1980s, but the land remained the property of the state. In 1993, artisanal miner migrants from Burkina Faso and Togo and villagers from northern Benin began recovering gold from abandoned Government exploration sites. The Government deployed the militia in 1996 to confiscate materials, mining equipment, and personal belongings from the miners and to force them out of the region. Militia efforts were not successful for long. The Government eventually implemented new policies that recognized this type of informal mining and delineated territories for small-scale mining, established cooperatives, and developed controls for gold trade (Grätz, 2003, p. 194-198). In 2004, gold exploration [no indication of whether it was by the Government or private companies] was concentrated around the Djougou/Aledjo-Koura and the Natitingou-Perma areas in northwestern Benin (Crankshaw, 2004).

Iron Ore.—Benin's iron ore resources, which are located at Loumbou-Loumbou and Madekali in the district of Borgou, were estimated to be as much as 500 million metric tons (Mt) at a grade of from 46% to 52% iron (Crankshaw, 2004). These resources remained undeveloped as of yearend 2004.

Industrial Minerals

Cement.—Cement was produced by Ciments du Benin S.A., Société des Ciments du Benin, and Société des Ciments d'Onigbolo. These companies had a combined cement production capacity of 925,000 metric tons per year (t/yr) (table 2).

[1]References that include a section mark (§) are found in the Internet References Cited sections.

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Peat.—Peat deposits, which have been estimated to be more than 12 Mt, have been identified near Cotonou. Other peat deposits have been identified in the Tono Lake area east of Lokosso and at Kpakpatan in the Mono region (Crankshaw, 2004).

Phosphate Rock.—Phosphate deposits have been identified in northern and southern Benin. Past phosphate exploration, which was sponsored by the UN Development Programme, the UN Revolving Fund for Natural Resources Exploration, Benin's Direcion des Mines de la Géologie et des Hydrocarbons, and the private sector, failed to identify resources that could be economical by large-scale mining methods (Crankshaw, 2004).

Mineral Fuels

Petroleum.—Benin began producing petroleum in 1982 from two wells in the Seme oilfield. During the 1980s, average petroleum production was about 8,000 barrels per day (bbl/d), but by 1996, production had tapered off to an average of 1,900 bbl/d (MBendi, 2005§). The oilfield was eventually shut down in 1998. Industrial Development Corporation Ltd. of South Africa was interested in reopening the Seme oilfield (African Energy, 2004).

Dallas, Texas-based Kerr-McGee LLC owned a 70% working interest in Block 4 offshore Benin. In 2004, the company was negotiating a farmout agreement with the Government to reduce its interest in the block to 40% (Kerr-McGee Corporation, 2005, p. 15; U.S. Securities and Exchange Commission, 2004, p. 16). The remaining 30% interest in the block was owned by Petroliam Nasional Bhd of Malaysia.

Infrastructure

In 2004, two infrastructure projects funded by the African Development Bank were underway. The projects included the $22.45 million Djougou-Ndali interstate national road project, which will connect Benin, Nigeria, and Togo, and the $18.31 million rural electrification project, which was part of Benin's electrification development program that has been extending electric power grids to towns and villages (afrolNews, 2004a§).

In November 2004, the World Bank approved $125 million to support the construction of a 678-kilometer-long gas pipeline to transport natural gas from Nigeria to Benin, Ghana, and Togo. The gas will be used initially for power generation and later on for other industrial and commercial applications (World Bank, 2004§).

Outlook

Although Benin seems to be ready to participate in the global economy, the likelihood of foreign investment possibilities in the mineral sector may be hindered by Benin's smuggling problems and lack of security along its border with Nigeria. Iron ore and phosphate deposits may become more accessible and attractive to investors following recent infrastructure investments in the country's road and electrification systems. Once the construction of the West African Gas Pipeline is finalized, the access to natural gas will also be of significance in the development of Benin's mineral resources.

References Cited

African Energy, 2004, West coast oil update—Benin: African Energy, no. 77, August 2004, p. 31.

Crankshaw, Paul, 2004, Benin, in Mining annual review 2004: London, United Kingdom, Mining Journal Ltd., CD-ROM.

Grätz, T., 2003, Gold mining and risk management—A case study from northern Benin: Ethnos, June 2, 2003, v. 68, p. 192-208.

Kerr-McGee Corporation, 2005, 2004 annual report: Oklahoma City, Oklahoma, Kerr-McGee Corporation, 160 p.

U.S. Securities and Exchange Commission, 2004, Annual report pursuant to section 13 or 15(d) of the Securities Exchange Act of 1934, Commission file number 1-16619, Kerr-McGee Corporation: Washington, DC, U.S. Securities and Exchange Commission, 161 p.

Internet References Cited

afrolNews, 2004a, (January 14), Financing for Beninese infrastructure secured, accessed May 3, 2005, at URL http://www.afrol.com/articles/10771.

afrolNews, 2004b, (August 12), South Africa, Benin deepen trade ties, accessed May 3, 2005, at URL http://www.afrol.com/articles/13695.

International Monetary Fund, 2005, Benin, World Economic Outlook Database, accessed May 11, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

Investir en Zone Franc, 2004, Strengthened cooperation between China and Benin, accessed May 19, 2005, at URL http://www.izf.net/izf/Guide/Benin/Acmc/Benin%20UK12.pdf.

Mbendi, 2005 (May 13), Overview, Benin—Oil and Gas Industry, accessed May 13, 2005, at URL http://www.mbendi.co.za/indy/oilg/af/be/p0005.htm.

People's Daily Online, 2004, China, Benin sign economic, technological cooperation accords, accessed May 19, 2005, at URL http://english.people.com.cn/200406/26/print20040626_147599.html.

Organisation for Economic Co-operation and Development, 2005, African economic outlook—Mali, accessed May 18, 2005, at URL http://www.oecd.org/dataoecd/44/25/34867795.pdf.

UN Office for the Coordination of Humanitarian Affairs, 2004, Benin, Four killed as police crack down on illegal fuel sellers, accessed May 18, 2005, at URL http://www.irinnews.org/print.asp?ReportID=42767.

U.S. Central Intelligence Agency, 2005, Benin, World Factbook 2004, accessed March, 31, 2005, at URL http://www.cia.gov/cia/publications/factbook/geos/bn.html.

U.S. Department of State, 2005a, Benin, Background Note, accessed May 13, 2005, at URL http://www.state.gov/r/pa/ei/bgn/6761.htm.

World Bank, 2004, World Bank approves funding for the West African Gas Pipeline in Benin, Ghana, Nigeria, and Togo, accessed May 19, 2005, at URL http://www.worldbank.org.

BURKINA FASO

Burkina Faso is a landlocked West African country bordered by Benin to the southeast, Côte d'Ivoire, Ghana, and Togo to the south, Mali to the north, and Niger to the northwest. The country's estimated 13.9 million inhabitants, as of 2004, share a land area of 274,200 km^2 (U.S. Central Intelligence Agency, 2005§). In 2004, Burkina Faso's GDP based on purchasing power parity was estimated to be about $15.7 billion (International Monetary Fund, 2005§). Mining did not play a significant role in the country's economy. The principal mineral commodities produced were cement, dolomite, gold, granite, marble, phosphate rock, pumice and related volcanic materials, and salt. Alluvial mining has been estimated to provide a living

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for as many as 50,000 families (Organisation for Economic Co-operation and Development, 2005, p. 124).

According to the Organisation for Economic Co-operation and Development (2004, p. 83-85), gold mining may help reduce the dependence on agriculture, and the price of gold and the reform of Burkina Faso's mining law may revive prospecting. Many of Burkina Faso's 170 existing exploration permits were granted in 2004 (Organisation for Economic Co-operation and Development, 2005, p. 123). The Canadian companies Axmin Inc., Channel Resources Ltd., Etruscan Resources Inc., Goldcrest Resources Ltd., High River Gold Mines Ltd., Jilbey Gold Exploration Ltd., Orezone Resources Inc., Riverstone Resources Inc., Semafo Inc., and St. Jude Resources Ltd. were actively exploring for gold. Also exploring for gold was Resolute Limited of Australia and Randgold Resources Ltd. and Ridge Mining plc (formerly Cluff Mining plc; name changed in May 2004) of the United Kingdom.

Government Policy and Legislation

Burkina Faso's mining law was revised in May 2003. Tax clauses, which included a reduced tax on mining company profits from 35% to 25% and reduced custom duties on machinery imports from 7.5% to 2.5%, had not been put into effect in 2004.

The privatization of Société Nationale d'Électricité du Burkina and Société Nationale Burkinabé d'Hydrocarbures was still underway (Organisation for Economic Co-operation and Development, 2005, p. 129-130).

Burkinabe Precious Metals Counter (CBMP), which was owned by the Government, was scheduled for privatization in 2004 (Organisation for Economic Co-operation and Development, 2005, p. 124). CBMP was a public entity in charge of production and the marketing of precious metals, supervising artisanal miners and small scale mines, buying gold from miners, and ensuring miner safety (Gueye, 2001, p. 6).

Commodity Review

Gold.—At least 10 Canadian companies, 2 United Kingdom companies, and 1 Australian company were exploring for gold in 2004. In May, Axmin completed a bankable feasibility study for the Bouroum permit; Axmin had previously purchased an 8% interest in the Bouroum permit from Channel Resources. Upon completion of the study, Axmin earned an additional 65% interest in the permit and announced its intention to acquire the remaining outstanding 27% (Mining Journal, 2004).

In June 2004, High River completed a feasibility study for the construction of a mine and mill to process ore from the Taparko-Boroum gold project. The Taparko-Bouroum project is located about 200 kilometers (km) northeast of the country's capital of Ouagadougou. The Taparko exploitation license was acquired by High River in August 2004, and the Boroum license, in June 2004. The construction of the open pit mine and mill facilities was expected to be completed by the end of the first quarter of 2006 and to cost $52 million. Mineral reserves were reported to be 7.6 Mt at a grade of 2.9 grams per metric ton (g/t) gold, or about 22,000 kilograms (kg) of contained gold. The average annual gold production was expected to be about 2,800 kg; mine life was thought to be about 7½ years. Ore was to be mined from three open pit operations at Bouroum and three at Taparko. Ore from Bouroum will be trucked to Taparko for processing. The processing facilities at Taparko will include crushing, grinding, gravity concentration, and a carbon-in-leach plant. Electrical power will be provided by on-site diesel generators. High River owned a 90% interest in the Taparko-Bouroum project, and the Government of Burkina Faso held the remaining 10% (African Mining, 2004b; High River Gold Mines Ltd., 2004).

In addition to the development of the Taparko Mine and mill, High River held exploration permits for three other areas—Area 8, which is located south of the Taparko-Boroum project; Gandi, which is located about 90 km southwest of the Taparko-Boroum project; and Labola, which is located in southwestern Burkina Faso. By yearend, exploration activities in Area 8 included a detailed induced polarization (IP)/resistivity survey, follow-up trenching, reconnaissance drilling, rock sampling, and soil geochemistry. The Gandi permit was still at an early stage of exploration. Soil geochemistry and geologic mapping were planned for 2005. At Labola, High River planned to conduct drilling, geologic mapping, and an IP/resistivity survey in 2005 (High River Gold Mines Ltd., 2004).

In February 2004, High River signed an agreement with Jilbey to form a strategic alliance in Burkina Faso. Under the agreement, Jilbey will act as High River's exploration arm in the country on an exclusive basis and will have defined rights to access the planned mill at Taparko. In addition, High River will have the right to acquire 50% of each of Jilbey's discoveries that prove economic within approximately 100 km of the planned Taparko facilities. Beyond these discoveries, Jilbey may develop the project on a 100% basis. In case Jilbey decides to have a partner to develop the property, the option should be given first to High River, which will then have 30 days to refuse it. Under the agreement, High River will also transfer all its existing exploration properties in the country with the exception of the Taparko-Bouroum property to Jilbey (High River Gold Mines Ltd, 2004; Jilbey Gold Exploration Ltd., 2004c).

Jilbey was actively exploring in Burkina Faso. The company held several permits for potential gold targets, such as the Bissa Group permits, which hosted the Bissa Hill gold deposit; the Hounde Group permits; the Kindo Group permits; and the Taparko Group permits. In October 2004, Jilbey announced the results of the resource estimates for Bissa Hill, which were calculated by SRK Consulting of Australia. Measured and indicated resources at Bissa Hill were estimated to be about 1.4 Mt at a grade of 3.33 g/t gold, or about 4,580 kg of contained gold. Inferred resources were estimated to be 106,000 metric tons (t) at a grade of 2.89 g/t gold, or about 300 kg of contained gold (Jilbey Gold Exploration Ltd., 2004a, b).

Several mineralization zones have been identified within the areas of the Bissa Group permits for which geochemical testing, infill drilling, and prospecting were carried out during the year. In June, Jilbey signed an option with a local artisanal mining operator to earn a 100% interest in the Kindo Group permits. Sampling and trenching were carried out at Kindo during the year, and Jilbey was awaiting assessment results.

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Work completed during 2004 at the Hounde Group of permits consisted of prospecting and regional geochemistry. The company planned to conduct follow-up geochemical analysis, drilling, and trenching to test for identified anomalies in the area (Jilbey Gold Exploration Ltd., 2004b).

In January 2004, Etruscan completed the acquisition of the Youga gold deposits and acquired a 100% interest in three contiguous exploration permits. The Youga gold deposits were located in the Province of Boulgou about 180 km southeast of Ouagadougou and 4 km north of the Ghanian border. The deposits are accessible by means of 70 km of paved highway and 120 km of dirt road. The geology of the Youga area is said to be similar to that of the Birimian gold belts of Ghana. The Youga exploitation permit includes the A2 East, the A2 Main, the A2 West 1, the A2 West 2, and the A2 West 3 deposits. Etruscan, through its wholly owned subsidiary Cayman Burkina Mines Ltd., held a 90% interest in Burkina Mining Company (the company that was granted the rights to mine the Youga gold deposits); the remaining 10% interest was held by the Burkinabe Government. Ashanti Goldfields Co. of Ghana, which was the company that had previously owned the deposits, had reported an indicated resource estimate of 9.1 Mt at a grade of 2.85 g/t gold, or about 25,900 kg contained gold, and an inferred resource of 2.88 Mt at a grade of 2.79 g/t gold, or about 8,000 kg of contained gold (Etruscan Resources Inc., 2004a). Etruscan contracted RSG Global of Australia to revise these estimates to be in compliance with National Instrument 43-101, which is a Canadian rule that governs how issuers disclose scientific and technical information about their mineral projects to the public (Association of Professional Geoscientists of Ontario, 2005§).

Etruscan awarded the drilling contract for the Youga deposits to Boart Longyear of Canada (Etruscan Resources Inc., 2004a). In June 2004, Etruscan announced that the diamond core drilling completed on the A2 West gold deposit confirmed high-grade gold mineralization, which included 8.95 g/t gold over 13.0 meters (m), 8.10 g/t gold over 12.2 m, and 6.06 g/t over 24.7 m. Etruscan held a total of 15 exploration permits in Burkina Faso (Etruscan Resources Inc., 2004b, c).

Goldcrest acquired Wentworth Resources Pty. Ltd. of Australia. Wentworth held the Kampti and the Malba concessions. The Kampti concession is located in the Province of Poni in southern Burkina Faso near the border with Côte d'Ivoire. The Malba concession is located near the town of Gaoua about 400 km southwest of Ouagadougou and about 40 km west of the border with Ghana. Goldcrest completed a reverse circulation drilling program that totaled 966 m in December 2004. Of the 11 holes drilled, 10 returned copper-gold mineralization (Goldcrest Resources Ltd., 2004a-c).

Orezone held 100% of the Essakan gold project, which is located about 330 km northeast of Ouagadougou. The project consists of six permits that covered an area of about 1,400 km^2. Orezone's joint-venture partner was Gold Fields Ltd. of South Africa, which had the option to acquire a 50% interest in the project by spending $8 million on exploration within a 5-year period that began in 2002. Upon completion of a bankable feasibility study, Gold Fields had the option to increase its interest in the project to 70% if it funded 100% of mine development costs. If a mine were developed at Essakan, then it would require additional infrastructure investments that would include power generation and a source of water. Access to the project was by paved and dirt roads (Orezone Resources Inc., 2005, p. 12).

Other properties owned by Orezone in Burkina Faso included Bombore, Bondi, Gueguere, Kerboule, and Sega. Bombore is located about 80 km north of Ouagadougou. Indicated resources were estimated to be about 14,600 kg of gold (reported as 471,000 troy ounces), and inferred resources, about 18,100 kg (reported as 582,000 troy ounces). Bondi is located about 250 km southwest of Ouagadougou. Indicated resources at Bondi were estimated to be about 1.76 Mt at a grade of 2.88 g/t gold, or about 5,000 kg of contained gold, and inferred resources, about 446,000 t at a grade of 2.41 g/t gold, or about 1,000 kg of contained gold. Gueguere is located about 240 km west of Ouagadougou; Kerboule is located about 250 km north of Ouagadougou near the border with Mali; and Sega is located about 200 km northwest of Ouagadougou. Inferred resources at Sega were estimated to be 3.3 Mt at a grade of 2.82 g/t gold. A $2 million drilling program was underway in 2004 (Orezone Resources Inc., 2005, p. 13-15).

In 2004, Gold Fields switched its focus from exploring regional targets in Burkina Faso to concentrating on the Essakan Main Zone deposit (EMZ), which is located within the Essakan gold project. An extensive drilling program was carried out during the year at the EMZ with the purpose of defining an economic resource to be developed as a stand-alone mine. During the year, five reverse-circulation rigs and one core drill rig were operating at the EMZ. As a result of preliminary drilling, the company announced that the new indicated resource estimates were 49 Mt at a grade of 1.49 g/t gold and that the inferred resources were 5.7 Mt at a grade of 1.7 g/t gold based on a cutoff grade of 0.50 g/t. Gold Fields planned to update resource estimates once again in June 2005, begin a feasibility study in September 2005, and make a production decision by June 2006 (Orezone Resources Inc., 2005, p. 4).

In November 2004, Goldbelt Resources Ltd. of Canada entered into an agreement with Resolute to acquire Resolute's 100% interest in the Belahouro, the Diosso, the Kari, the Kiere, and the Mandiaso gold exploration properties (Goldbelt Resources Ltd., 2004).

Riverstone held the rights to the Rambo and the Solna properties. In November, the company entered into an option with Orex Resources S.A.R.L. to acquire an 80% interest in Orex's Liguidi Malguem property, which is a 225-km^2 area that is located about 125 km southeast of Ouagadougou. The Rambo property encompasses an area of about 150 km^2 in north-central Burkina Faso. During 2004, exploration activities included geochemical soil sampling, geologic sampling, and drilling. Riverstone acquired the Solna property in November 2004. The Solna property covers an area of 160 km^2 and is located in eastern Burkina Faso. The company planned to conduct geochemical rock and soil sampling and geologic mapping (Riverstone Resources Inc., 2004a-d).

In December 2004, Semafo was internally revising a feasibility study prepared by Managem S.A. of Morocco for the Mana gold project. The company owned a 100% interest in

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the project. Semafo planned to obtain a mining permit and to create a local operating company. Once the company is created, the Burkinabe Government will be entitled to a 10% interest in it. The envisioned mine was expected to operate for 6 years and to produce about 3,000 kilograms per year (kg/yr) (reported as 100,000 troy ounces per year) during the first 2 years of operation and an average of 2,800 kg/yr for the remaining life of the mine (Semafo Inc., 2004; 2005, p. 8, 13).

St. Jude held a prospecting license for the Goulagou/Rounga project, which is located in the north-central region of Burkina Faso. The previous operator of the property was Channel Resources. On the basis of preliminary metallurgical tests on oxide samples, Channel had reported gold recoveries of up to 95% and had calculated inferred resources to be 24,000 kg (reported as 774,700 troy ounces). In 2004, St. Jude carried out definition drilling and performed metallurgical tests at the property and planned to conduct additional exploration drilling and follow-up in-fill drilling (St. Jude Resources Ltd., 2004, p. 2-3).

Manganese.—Manganese reserves at Burkina Faso's Tambao deposit, which is located to the northeast of the country, were estimated to be about 19 Mt of ore that averages 51.45% manganese. Operations at Tambao were suspended in 1998 owing to low manganese prices, which made the cost of moving the manganese ore about 250 km to the nearest railway and ocean ports uneconomic. The mine remained closed in 2004 (World Trade Organization, 2004§).

Zinc.—On June 16, 2004, Aim Resources Ltd. (AIM) of Australia signed a memorandum of agreement with BHP Billiton and Metorex Ltd. of South Africa to acquire 100% of Metorex Burkina Faso BV (MBF). MBF (a subsidiary of Metorex) was the owner of the Perkoa zinc deposit, which is located about 125 km west of Ouagadougou. AIM was to pay Metorex $1.1 million, 50% in cash and 50% in AIM shares. In 2004, about 23,000 m of drilling was completed in more than 74 diamond drill holes. Metorex had acquired 90% of the project in 2001; the remaining 10% was owned by the Government of Burkina Faso. In 2004, AIM hired Snowden Mining Industry Consultants of Australia to recalculate resources at the Perkoa zinc deposit. The recalculated inferred mineral resource at Perkoa was reported to be 7.06 Mt at grades of 17.7% zinc and 37.8 g/t silver (at a 10% zinc cutoff). The cost of developing a mine and concentrator at Perkoa was estimated to be between $40 million and $60 million (African Mining, 2004a, c; Aim Resources Ltd., 2004).

Infrastructure

The Government was trying to increase local energy production with the help of funding agencies. On November 30, 2004, the World Bank approved a $63.58 million grant to help fund an electricity development plan for Bobo Dioulasso and Ouagadougou. The project included the construction of two powerplants with capacities of 14 megawatts (MW) and 7 MW in the Ouagadougou area. The country's total installed capacity was 172 MW (Organisation for Economic Co-operation and Development, 2005, p. 130).

The African Development Bank granted Burkina Faso $5.4 million for a feasibility study to establish a rail line that will connect the country to Ghana. One of the uses of the rail line will be to export manganese ore (Sakyi-Addo, 2004§).

Another ongoing project was the upgrading of about 1,000 km of roads in 13 Provinces around the country, which included the upgrading of 865 km of cotton farm track in the west and 110 km of track that serves the Provinces of Houet and Kadiogo (afrolNews, 2004§).

Outlook

The growth potential of Burkina Faso's mining sector will depend on the success of ongoing gold exploration activities, the implementation of the new mining law, the successful development of the Perkoa zinc deposit, the increase in electricity capacity, and the update of the country's basic infrastructure.

References Cited

African Mining, 2004a, Burkina Faso, in Country updates: African Mining, v. 9, no. 5, September-October, p. 6.

African Mining, 2004b, High River plans open-pit gold mine in Burkina Faso: African Mining, v. 9, no. 4, July-August, p. 22-23.

African Mining, 2004c, Resource estimate highlights Perkoa's quality: African Mining, v. 9, no. 5, September-October, p. 29.

Aim Resources Ltd., 2004, Aim signs MOA with BHP Billiton and Metorex Limited: Sydney, Australia, Aim Resources Ltd. press release, June 16, 4 p.

Etruscan Resources Inc., 2004a, Etruscan completes acquisition of Youga gold deposits: Windsor, Nova Scotia, Canada, Etruscan Resources Inc. press release, January 5, 4 p.

Etruscan Resources Inc., 2004b, High-grade gold intersections at the Youga A2 West deposit: Windsor, Nova Scotia, Canada, Etruscan Resources Inc. press release, June 22, 1 p.

Etruscan Resources Inc., 2004c, Etruscan significantly expands holdings in Burkina Faso: Windsor, Nova Scotia, Canada, Etruscan Resources Inc. press release, October 28, 3 p.

Goldbelt Resources Ltd., 2004, African gold property acquisition agreement revised: Toronto, Ontario, Canada, Goldbelt Resources Ltd. press release, November 22,
2 p.

Goldcrest Resources Ltd., 2004a, Goldcrest confirms potential of the copper-gold mineralization at the Malba project in Burkina Faso: Toronto, Ontario, Canada, Goldcrest Resources Ltd. press release, December 14, 5 p.

Goldcrest Resources Ltd., 2004b, Goldcrest Resources Ltd. completes acquisition of Wentworth Resources Pty. Ltd.: Toronto, Ontario, Canada, Goldcrest Resources Ltd. press release, June 16, 4 p.

Goldcrest Resources Ltd., 2004c, Prospective 245 km^2 Kampti permit in Burkina Faso granted to Goldcrest: Toronto, Ontario, Canada, Goldcrest Resources Ltd. press release, September 23, 4 p.

Gueye, Djibril, 2001, Small-scale mining in Burkina Faso: London, United Kingdom, International Institute for Environment and Development, 35 p.

High River Gold Mines Ltd., 2004, High River Gold exploration update in Burkina Faso: Toronto, Ontario, Canada, High River Gold Mines Ltd. press release, December 2, 3 p.

Jilbey Gold Exploration Ltd., 2004a, Jilbey Gold announces resource estimate on the Bissa Hill deposit in Burkina Faso: Toronto, Ontario, Canada, Jilbey Gold Exploration Ltd. press release, October 13, p. 3 p.

Jilbey Gold Exploration Ltd., 2004b, Jilbey gold plans drilling programs for 2004-2005: Toronto, Ontario, Canada, Jilbey Gold Exploration Ltd. press release, September 16, p. 2 p.

Jilbey Gold Exploration Ltd., 2004c, Strategic alliance agreement between High River Gold and Jilbey Gold results in aggressive exploration plans for Burkina Faso: Toronto, Ontario, Canada, Jilbey Gold Exploration Ltd. press release, February 18, p. 4 p.

Digitized by Google

Mining Journal, 2004, West Africa, a new gold era?: Mining Journal, October 29, p. 20-21.
Organisation for Economic Co-operation and Development, 2004, African economic outlook—Burkina Faso: Paris, France, Organisation for Economic Co-operation and Development, 92 p.
Organisation for Economic Co-operation and Development, 2005, African economic outlook—Burkina Faso: Paris, France, Organisation for Economic Co-operation and Development, 540 p.
Orezone Resources Inc., 2005, 2004 annual report: Ottawa, Ontario, Canada, Orezone Resources Inc., 20 p.
Riverstone Resources Inc., 2004a, Exploration starts at Rambo gold property: Vancouver, British Columbia, Canada, Riverstone Resources Inc. press release, January 26, 2 p.
Riverstone Resources Inc., 2004b, High grade drill intersection at Rambo gold property: Vancouver, British Columbia, Canada, Riverstone Resources Inc. press release, October 20, 2 p.
Riverstone Resources Inc., 2004c, Liguidi Malguem gold property option: Vancouver, British Columbia, Canada, Riverstone Resources Inc. press release, November 3, 2 p.
Riverstone Resources Inc., 2004d, Solna gold permit acquired: Vancouver, British Columbia, Canada, Riverstone Resources Inc. press release, November 23, 2 p.
Semafo Inc., 2004, Mana gold project feasibility study: Montreal, Quebec, Canada, Semafo Inc. press release, December 8, 2 p.
Semafo Inc., 2005, 2004 annual report: Saint-Laurent, Quebec, Canada, Semafo Inc., 64 p.
St. Jude Resources Ltd., 2004, 3rd quarter interim financial statements—October 31, 2004: Delta, British Columbia, Canada, St. Jude Resources Ltd., 16 p.

Internet References Cited

afrolNews, 2004, Burkina Faso's road network to improve, accessed May 11, 2005, at URL http://www.afrol.com/printable_article/14331.
Association of Professional Geoscientists of Ontario, 2005, National Instrument 43-101, accessed May 31, 2005, at URL http://www.apgo.net/cpd/NI43101.
International Monetary Fund, 2005, Burkina Faso, World Economic Outlook Database, accessed May 11, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.
Sakyi-Addo, Kwaku, 2004, Ghana, Burkina Faso eye rail link to bypass Ivory Coast, accessed May 21, 2004, at URL http://biz.yahoo.com/rm/040520/transport_westafrica_2.html.
U.S. Central Intelligence Agency, 2005, Burkina Faso, World Factbook 2004, accessed March, 31, 2005, at URL http://www.cia.gov/cia/publications/factbook/geos/uv.html.
World Trade Organization, 2004, Trade Policy Review—Burkina Faso, accessed September 28, 2005, at URL http://www.wto.org/english/tratop_e/tpr_e/s132-4_e.doc.

SAO TOME E PRINCIPE

The Democratic Republic of Sao Tome e Principe consists of the islands of São Tomé and Príncipe and several islets in the Gulf of Guinea. The islands of São Tomé and Príncipe are located in the equatorial Atlantic about 300 and 250 km, respectively, off the northwestern coast of Gabon. The country's estimated 182,000 inhabitants, as of 2004, share a total land area of 1,001 km^2 (U.S. Central Intelligence Agency, 2005§). The GDP based on purchasing power parity was estimated to be about $245 million in 2004 (International Monetary Fund, 2005§). The country was mostly dependent on the production of cocoa, which accounted for about 95% of exports (U.S. Department of State, 2005§).

Potential exists for the development of the country's petroleum industry. In 1999, the Governments of Nigeria and Sao Tome e Principe began negotiations on the territorial claims of an overlapping maritime boundary area within the two countries' exclusive economic zones. An agreement for joint development of the resources within the area was reached in 2001. The affairs of the joint development zone (JDZ), as the area was known, were managed by the Joint Development Authority (JDA), which was created in January 2002. The JDA reports to a Joint Ministerial Council (JMC), which has the responsibility for all matters that concern the exploration for and mining of the resources in the JDZ. Under the agreement, Nigeria will have the right to 60% of all revenues from oil and gas exploration and production, and Sao Tome e Principe will have the remaining 40%. In 2004, Government initiatives to develop the petroleum industry included the creation of a new law that established an oil fund which will be managed by an international custodial bank. All oil payments are to be made directly into the fund. The law also created a public oversight commission, requires competitive tenders for oil contracts, makes oil contracts public, and mandates the inclusion of anticorruption and transparency provisions (Bell, 2005).

In April 2003, the JDZ was divided into nine blocks, and a licensing round was opened for bids. In April 2004, a production-sharing contract (PSC) for Block 1 was awarded to a consortium lead by Chevron Texaco JDZ Ltd. (51%) (a subsidiary of ChevronTexaco Corporation of United States); the other coinvestors in the block were Esso Exploration and Production Nigeria-São Tomé "One" Ltd. (40%) and Dangote Energy Equity Resources Ltd. (9%), which was a joint venture between the Dangote Group of Nigeria and Energy Equity Resources AS of Norway. ChevronTexaco will be the operator of the block. The consortium paid a signature bonus of $123 million for exploration rights. As of December 2004, the consortium continued to negotiate the terms of the PSC with the JDA. Drilling was scheduled to begin during the first half of 2005. Block 1 was the only block awarded during the round (ChevronTexaco Corporation, 2005; UN Office for the Coordination of Humanitarian Affairs, 2004§; Nigeria-São Tomé and Príncipe Joint Development Authority, 2005§; U.S. Department of State, 2005§).

A second round in which five blocks were offered opened in November 2004. Among the 23 companies that participated in the second round were Devon Energy Corporation, Environmental Remediation Holding Corporation, and Pioneer Resources Africa Limited (afrolNews, 2004§; Rigzone.com, 2004§). Petroleum reserves in the JDZ have been estimated to be about 6 billion barrels (Schlumberger, 2004§).

The U.S. Trade and Development Agency awarded two grants to Sao Tome e Principe's Ministry of Public Works in 2004. The first grant, which was in the amount of $450,000, will fund a feasibility study for the construction of a deepwater port in Sao Tome, and the second grant, which was in the amount of $350,000, will fund technical assistance for Sao Tome's airport expansion (U.S. Trade and Development Agency, 2004§).

Outlook

Sao Tome e Principe's economy will likely be dominated by the petroleum sector in the long run if commercial quantities of petroleum are discovered within the country's territorial waters in the Gulf of Guinea. Growth in the sector, however, will

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depend on the successful development of any such discoveries, ongoing offshore exploration activities, and the Government's interest in continuing to adopt measures to establish new standards that will help manage its petroleum resources. The recent enactment of an oil revenue law suggests that the Government is interested in moving forward with its policy to develop the country's hydrocarbon resources.

References Cited

Bell, J.C., and Faria, T.M., 2005, São Tomé and Príncipe enacts oil revenue law, sets new transparency, accountability, and governance standards: Oil, Gas and Energy Law Intelligence, v. 3, no. 1, March, p. 1-8.

ChevronTexaco Corporation, 2005, Chevron Texaco and its co-venturers sign production sharing contract on block 1 of Nigeria and São Tomé and Príncipe joint development zone: Lagos, Nigeria, ChevronTexaco Corporation press release, February 1, 1 p.

Internet References Cited

afrolNews, 2004, Many bids on Nigeria-Sao Tome oil blocks, accessed May 11, 2005, at URL http://www.afrol.com/articles/15018.

International Monetary Fund, 2005, São Tomé and Príncipe, World Economic Outlook Database, accessed May 11, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

Nigeria-São Tomé and Príncipe Joint Development Authority, 2005, Introduction to Nigeria-São Tomé and Príncipe Joint Development Authority, accessed July 5 2005, at URL http://www.nigeriasaotomejda.com.

Rigzone.com, 2004, ERHC participates in JDZ bid round, accessed December 19, 2004, at URL http://www.rigzone.com/news/article.asp?a_id=18791.

Schlumberger, 2004, Chevron Texaco clears hurdle for São Tomé oil pact, accessed December 2 2004, at URL http://www.slb.com/news/story.cfm?storyid=623100.

UN Office for the Coordination of Humanitarian Affairs, 2004, São Tomé and Principe—Signing of first oil exploration agreement delayed, accessed July 5, 2005, at URL http://www.irinnews.org/print.asp?ReportID=44784.

U.S. Central Intelligence Agency, 2005, São Tomé and Príncipe, World Factbook 2004, accessed March, 31, 2005, at URL http://www.cia.gov/cia/publications/factbook/geos/tp.html.

U.S. Department of State, 2005, São Tomé and Príncipe, Background Note, Bureau of African Affairs, accessed May 13, 2005, at URL http://www.state.gov/r/pa/ei/bgn/5434.htm.

U.S. Trade and Development Agency, 2004, USTDA supports development of key infrastructure projects in São Tomé and Príncipe, accessed September 28, 2005, at URL http://www.tda.gov/USTDA/Press Release Archive/Press Releases/2004/Februay 2004/Feb19_04.html.

TABLE 1
BENIN AND BURKINA FASO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2000	2001	2002	2003	2004
BENIN						
Cement, hydraulic		250,000	250,000	250,000	250,000	250,000
Clay		--	17,716	19,000 e	21,000	21,000
Gold	kilograms	--	16	20	20	20
Gravel	cubic meters	33,027	24,675	26,000 e	28,500	29,000
BURKINA FASO[2]						
Cement		100,000	50,000	30,000 e	30,000	30,000
Dolomite	cubic meters	NA	3,000	3,000	3,000	3,000
Gold	kilograms	625 r	229 r	209 r	770 r	1,125 [3]
Granite	cubic meters	NA	280,000	300,000	300,000	300,000
Phosphate rock:						
Gross weight		NA	1,010	2,350	2,400	2,400
P_2O_5 content		NA	280	650	650	650
Pumice and related volcanic materials e		10,000	10,000	10,000	10,000	10,000
Salt e		5,000	5,000	5,000	5,000	5,000
Stone, marble e		100,000	100,000	100,000	100,000	100,000

eEstimated; estimated data are rounded to no more than three significant digits. NA Not available. rRevised. -- Zero.

[1]Table includes data available through July 8, 2005.

[2]In addition to the commodities listed, sand and gravel and other construction materials are produced, but information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

TABLE 2
BENIN: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Société des Ciments d'Onigbolo (Amida Group, 100%)	Onigbolo plant	450,000 cement; 500,000 clinker.
Do.	Ciments du Benin S.A. (Scancem International of Norway, 48.7%)	Cotonou plant	275,000 cement.
Do.	Société des Ciments du Benin (Government, 50%, and private, 50%)	do.	200,000 cement.

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The Mineral Industry of Botswana

By Philip M. Mobbs

The Republic of Botswana's mineral industry continued to be dominated by diamond production, which also was the mainstay of the national economy. Most of Botswana's diamond production was of gem quality, which resulted in the country's position as the world's leading producer of diamond by value. Copper, nickel, and soda ash production also played significant though smaller roles in the national economy. Mining accounted for about 36% of Botswana's real gross domestic product (GDP). About 50% of Government revenues were derived from mining and mineral-processing activity. As of August 2004, 64 companies held or retained a total of 556 prospecting licenses, of which 432 were for diamond or precious stones. Because of the recent influx of new exploration companies, a Chamber of Mines was expected to be formed by the mining industry in 2005 (Bank of Botswana, 2005, p S-10, S-97; Mining Journal, 2004).

In 2004, the four major mineral-producing companies, which were BCL Ltd., Botswana Ash (Pty.) Ltd. (Botash), Debswana Diamond Co. (Pty.) Ltd., and Tati Nickel Mining Co. (Pty.) Ltd.; quarries; and small mines employed 14,264 people. Mupane Gold Mining (Pty.) Ltd. was expected to add about 350 to the mining sector employment roles (Department of Mines, 2005, p. 15).

Botswana's GDP based on purchasing power parity was estimated to be $16.2 billion[1] in 2004 with an estimated real growth rate of 4.9% and an inflation rate of 6.6%. The per capita GDP based on purchasing power parity was estimated to be $10,169. The per capita GDP level was one of the highest in Africa and placed Botswana in the category of upper-middle-income countries (International Monetary Fund, 2005§[2]).

Trade

According to the Bank of Botswana (2005, p. S-83—S-84), the value of all merchandise exports for 2004 was $3.49 billion. Mineral exports, of which diamond accounted for $2.82 billion; copper and nickel matte, $166 million; and soda ash, about $54 million, represented 87% of total merchandise exports. The provisional value of all merchandise imports through October 2004 was $2.86 billion. For the 10-month period, fuel imports amounted to $325 million, and metal and metal products, $228 million. Because of increased international fuel prices, the value of the fuel imports for the first 10 months of 2004 was nearly triple the value of fuel imported in 2003, which had been revised to $106 million.

Botswana's 600,379-square-kilometer (km^2) area was located in southern Africa, surrounded by Namibia to the west and north, South Africa to the east and south, and Zimbabwe to the north and east. Most merchandise trade was shipped via rail or truck through South Africa.

Commodity Review

Metals

Copper and Nickel.—The copper and nickel industry in Botswana was dominated by BCL and Tati (a subsidiary of LionOre Mining International Ltd. of Canada). During 2004, BCL mined 2.496 million metric tons (Mt) of ore from its operations at Selebi-Phikwe, and Tati extracted 3.257 Mt of ore from the Phoenix open pit mine. Most of Tati's concentrates were treated at the BCL smelter, which was located about 200 kilometers (km) away. During 2004, the BCL smelter produced 54,448 metric tons (t) of nickel-copper-cobalt matte, which was sold to Centametall AG. Centametall shipped the matte to Norway and Zimbabwe for refining (Department of Mines, 2005, p. 5; LionOre Mining International Ltd., 2005, p. 10-13, 46).

In 2004, LionOre commissioned an 8-metric-ton-per-day-capacity pilot plant that used Western Minerals Technology Pty. Ltd.'s proprietary Activox® hydrometallurgical process to leach concentrate at its Phoenix facility. The plant successfully produced copper and nickel cathode and cobalt precipitate. On-site processing of Tati's ore would result in available processing capacity at the BCL smelter. Exploration projects that were underway, if brought to production, could fill the capacity void (Western Minerals Technology Pty. Ltd., undated§).

African Copper plc continued its evaluation of the Dukwe copper project and adjacent Matsitama licenses. A prefeasibily study on the Dukwe sulfide deposit, which was located about 130 km northwest of Francistown, was begun in September.

In 2004, Discovery Nickel Ltd. drilled two confirmation holes, contracted out a resource estimate, and initiated an airborne electromagnetic survey of the Dikoloti nickel license, which was located about 45 km from the BCL smelter. Discovery's exploration activity was to earn an 80% interest in the Northeast Botswana Brownfields Nickel Project from joint-venture partner Falconbridge Exploration (Pty.) Ltd. of Botswana.

Tau Mining Botswana (Pty.) Ltd. completed an airborne geophysical survey of its 10-prospecting-license Molopo Farms project, which was located about 175 km west of Gaborone. Previous drilling in the prospect area had discovered polymetallic (copper, nickel, and platinum-group metals) deposit.

WMC Resources Exploration Pty. Ltd. of Australia entered into an exploration and development joint venture with Albidon Ltd. of Australia. Albidon held nine nickel-prospecting licenses; seven were located south of the Selebi and the Pikwe nickel mines, and two, north of Francistown. In 2004, the joint venture of Albidon and Gallery Gold Ltd. of Australia completed a geophysical survey across the Tekwane nickel prospect.

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[1]Where necessary, values have been converted from the Botswana pula (BWP) to U.S. dollars (US$) at the rate of BWP4.66=US$1.00 for 2004 and BWP5.00=US$1.00 for 2003.

[2]References that include a section mark (§) are found in the Internet References Cited section.

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Gold.—In October, Mupane Gold (a subsidiary of Gallery Gold Ltd. of Australia) began commercial gold operations at the Mupane Mine, which was located about 30 km southwest of Francistown. Ore was sourced from the Tau open pit. Additional reserves were available from the nearby Kwena and Tolo deposits. Gallery Gold proposed to begin ore production from the Map Nora deposit in 2005. Map Nora ore would be processed at the Mupane facility. Gallery Gold continued exploration of other gold occurrences near the Mupane facility; these included the Maitengwe lease, the Golden Eagle and the Kite prospects on the Sashe license, and the Vumba lease. The joint venture of A-Cap Resources Ltd. and Gallery Gold drilled the Jim's Luck gold prospect. Gallery Gold also held two gold exploration licenses in joint venture with Albidon.

Tawana Resources NL of Australia agreed to sell its 85% interest in Joren (Pty.) Ltd. Joren operated the Somerset placer gold facility, which produced 1.27 kilograms (kg) of gold in 2004, compared with 9 kg in 2003 (Department of Mines, 2005, p. 8).

Lead, Silver, Vanadium, and Zinc.—Mount Burgess Mining N.L. drilled the Kihabe base metals project, which was located 700 km northwest of Gaborone. Selected samples of drill cuttings were assayed for copper, lead, silver, and zinc. The assay confirmed lead, silver, and zinc mineralization.

Industrial Minerals

Clay, Gravel, Sand, and Stone.—In 2004, 77 companies employed about 1,000 people in the construction materials sector. Quarries and sand pits, which included operations at Francistown, Gaborone, Ghanzi, Hukuntsi, Jwaneng, Lobatse, Maun, Mabutsane, Molepolole, Selebi-Phikwe, Serow, Takatshawaane, Tsau, Tshabong, and Tsoe, were spread out across the nation, not concentrated along the denser populated strip from Gabrone to Francistown in eastern Botswana. In 2004, Pretoria Portland Cement Co. Ltd. acquired 100% interest in the Kgale Quarry.

Diamond.—Debswana (a 50-50 joint partnership of De Beers Centenary AG and the Government) accounted for all diamond production from its four mines. Despite a strike by mine workers in August, Debswana treated about 30.4 Mt of ore during 2004 to yield 31.1 million carats, which was an increase of 2% compared with carat production in 2003. Debswana's diamond production included 16.070 million carats from the Orapa Mine, 13.683 million carats from the Jwaneng Mine, 1.033 million carats from the Letlhakane Mine, and 339,000 carats from the Damtshaa Mine. In December, the mining license for Jwaneng was renewed for 25 years (Debswana Diamond Co. (Pty.) Ltd., 2005, p. 26).

In April, De Beers (51%) and African Diamonds plc (49%) formed the joint venture Boteti Exploration (Pty.) Ltd. By yearend, the Boteti joint venture had drilled and bulk sampled 2 kimberlites on its Orapa area license and planned to bulk-sample 27 other kimberlites. Kalahari Diamond Ltd. entered a joint venture with African Diamonds to earn 60% of African Diamonds' interest in new discoveries on the Orapa licenses. Sekaka Diamonds (Pty.) Ltd. (formerly Godi (Pvt) Ltd.) (a subsidiary of Kalahari Diamonds) held about 114 prospecting licenses that it had acquired from BHP Billiton Ltd.

De Beers (51%) and Firestone Diamonds plc (49%) formed a joint venture to explore the 3,200-km^2 Mopipi project, which is located about 450 km north of Gaborone. At yearend, the joint venture acquired an additional prospecting license near the Orapa Mine, and Firestone acquired six additional prospecting licenses near the Jwaneng and the Orapa Mines.

Numerous other companies were exploring for diamond in Botswana. DiamonEx Ltd. of Australia drilled five kimberlites on the Martin's Drift project, which was located about 90 km southeast of Palapye. Gcwihaba Resources (Pty.) Ltd. (a subsidiary of Tsodilo Resources Ltd.) began a drill program on its seven-license Ngamiland prospect in northwest Botswana. Immediately to the north of the Gcwihaba properties, Newdico (Pty.) Ltd. [a joint venture of Tsodilo (75%) and the Trans Hex Group (25%)] completed a drilling program and geophysical surveys on its 18-license Ngamiland prospect. Helio Resources Corp. agreed to acquire interest in the Lokgwabe licenses, which were located west of Kang, from Jatinga (Pty.) Ltd.

In 2004, Motapa Diamonds Inc. sampled the Central Kalahari, the Khutse, the Lobatse, the Mokubilo, and the Serule licenses; retained 28 prospecting licenses with a combined area of 17,742 km^2; and relinquished the Lobatse group licenses. A joint venture of Motapa and AfriOre Botswana (Pty.) Ltd. held seven diamond prospecting licenses. Rio Tinto Mining and Exploration Ltd. and Trivalence Mining Corp. continued their evaluation of the Kokong prospect. Rio Tinto's work earned it a 65% interest in the joint venture, which, in 2004, reduced the size of its license area to 2,272 km^2 from the original 3,745 km^2. Tawana Resources sampled diamond prospects on the Seolo license.

In 2003, Debswana sold Teemane Manufacturing Co. (Pty.) Ltd. to Diarough NV. Teemane was a diamond-cutting and polishing company based in Serowe. In 2004, Eurostar Diamond Holdings SA initiated work on a diamond-cutting facility in Gaborone; the plant was expected to reach full operating capacity in 2006. The Star Diamond Group BV also opened a diamond-cutting plant in Gaborone in 2004. Schachter & Namdar Polishing Works, Ltd. operated the diamond-cutting factory in Molepolole. All four firms imported uncut diamond from De Beers Diamond Trading Co.

Soda Ash.—Botswana Development Corp. and the Botswana Export Development and Investment Authority investigated the feasibility of manufacturing glass in Botswana. Soda ash, which was a primary raw material for glass, was produced in Botswana, but except for local sales of about 200 metric tons per year (t/yr), most of Botash's soda ash production was exported. A proposed feasibility study was expected to evaluate silica sand and limestone deposits in Botswana and the potential to export glass; glass consumption by the country's population of 1.56 million was not expected to support a glass manufacturing industry.

Mineral Fuels

Coal.—The Morupule coalfield contains more than 5 billion metric tons of reserves. Debswana operated the Morupule Colliery at Palapye, which was located about 175 km southof Francistown. More than one-half of the company's coal

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production was sold to the adjacent Morupule Power Station (MPS) of Botswana Power Corp. (BPC). The Morupule Colliery also supplied coal to the BCL copper-nickel facility, the Botash soda ash operation at Sua Pan, and Makoro Brick and Tile (Pty.) Ltd. In 2004, 916,036 t of coal was mined, which was an 11% increase compared with the total in 2003. Coal sales in 2004 were 897,244 t, which was a 9% increase compared with the total in 2003. Some of the increased production was attributed to the installation of a Joy 12HM31B continuous miner, which replaced conventional cutters and loaders (Debswana Diamond Co. (Pty.) Ltd., 2005, p. 28-29; Joy Global Inc., 2003§; Morupule Colliery Ltd., 2004§).

The MPS supplied about 30% of the country's electrical power demand; the remainder was imported, primarily from South Africa. Increased electricity demand in South Africa could affect Eskom Holdings Ltd.'s sale of surplus electrical power to BPC after the current sales contract expires in 2007. To offset the potential loss of South African power, an expansion of the MPS to 532 megawatts (MW) from 132 MW was proposed. The expansion was expected to triple MPS' coal demand to about 1.2 million metric tons per year by 2009. The Morupule Colliery could be expected to increase production significantly to meet the projected demand from the MPS (United Nations Framework Convention on Climate Change, 2005§).

Outlook

The Government's attempt to diversify the economy has yet to be successful. International interest in exploration for diamond and base and precious metals is expected to continue. The country's favorable geologic environment, mineral investment climate, low tax rates, and political stability are expected to continue to make Botswana a target for foreign mineral investment. The Government encourages mineral value-added processing, but the lack of water in landlocked Botswana restricts large-scale industrial development. The country's small domestic market and the additional cost of transportation to ports in South Africa also limit the nation's attractiveness to investment by foreign manufacturers. High fuel costs would continue to impact the cost of transportation of Botswana's imports and exports adversely.

Resumption of commercial gold production will help diversify the mineral industry slightly with the addition of $40 million to $50 million per year of nondiamond income, but revenues from diamond operations are expected to continue to be the mainstay of the country's economy for the foreseeable future. Debswana's identified diamond resources will be sufficient to maintain 2004 production levels for at least 25 to 30 years. Nickel and copper, which are jointly mined, also are expected to continue to bring significant foreign exchange into the country. The continued devaluation of the U.S. dollar against the Botswana pula could be a negative factor because dollar-denominated commodity sales would effectively provide mining companies with less local currency to meet domestic operating costs.

The unemployment rate in Botswana is more than 20%. Mineral production companies, which account for about 4% of the national workforce, are not expected to reduce the unemployment rate. The Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) epidemic has adversely affected Botswana. In 2003 (the last year for which data were available), an estimated 22% of the total population was thought to be HIV positive. Many of the companies in the mineral industry maintain HIV/AIDS information and treatment programs that are coordinated with Government programs (Joint United Nations Programme on HIV/AIDS, 2004, p. 190).

Given the country's extensive coal resources and projected regional power demand, Botswana also has the potential to develop and support a small-scale coal-bed methane industry and additional coal-fueled electricity-generating plants that could supply power to the South African Power Pool through its land lines to South Africa.

References Cited

Bank of Botswana, 2005, Annual report—2004: Gaborone, Botswana, Bank of Botswana, 118 p.

Debswana Diamond Co. (Pty.) Ltd., 2005, Annual review—2004: Gaborone, Botswana, Debswana Diamond Co. (Pty.) Ltd., 44 p.

Department of Mines, 2005, 2004 Annual report: Gaborone, Botswana, Department of Mines, 21 p.

Joint United Nations Programme on HIV/AIDS, 2004, 2004 report on the global AIDS epidemic: Geneva, Switzerland, Joint United Nations Programme on HIV/AIDS, 231 p.

LionOre Mining International Ltd., 2005, Annual report 2004: Toronto, Ontario, Canada, LionOre Mining International Ltd., 124 p.

Mining Journal, 2004, First Chamber of Mines for Botswana: London, United Kingdom, Mining Journal, November 12, p. 3.

Internet References Cited

International Monetary Fund, 2005 (September), Saudi Arabia, World Economic Outlook Database, accessed September 30, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.

Joy Global Inc., 2003 (July 25), Joy South Africa receives Morupule order, accessed November 3, 2005, at URL http://www.joy.com/whats_new/07-25-03.htm.

Morupule Colliery Ltd., 2004, General information, accessed November 14, 2005, at URL http://www.mcl.co.bw/GenInfo.htm.

United Nations Framework Convention on Climate Change, 2005 (October 20-21), Clean coal power project in Botswana, UNFCCC Workshop on Innovative Options for Financing the Results of the Technology Needs Assessments, accessed November 3, 2005, via URL http://ttclear.unfccc.int/ttclear/html/WshpBonnPresentations.html.

Western Minerals Technology Pty. Ltd., [undated], Tati hydrometallurgical plant, accessed November 14, 2005, at URL http://www.wmt.com.au/tati.htm.

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TABLE 1
BOTSWANA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
Coal, bituminous		946,900	930,374	953,081	822,780	916,036
Cobalt, smelter output, Co content of matte[3, 4]		308	325	269	294 r	223
Copper:						
Mine output, Cu content of ore milled[e]		34,600	26,700	27,800	31,380 r, 5	29,460 5
Smelter output, matte, gross weight[3]		48,420	50,999	56,625	51,983 r	54,448
Smelter output, Cu content of matte[3, 4]		18,722	19,209	21,590	24,292 r	21,195
Diamond[6]	thousand carats	24,635	26,416	28,397	30,412 r	31,125
Gemstones, semiprecious[7]	kilograms	80,000 e	76,000	127,000	102,000	99,000
Gold[8]	do.	4	2	8	9 r	162
Nickel:						
Mine output, Ni content of ore milled		38,420	26,700 e	28,600 e	38,230 r	35,820
Smelter output, matte, gross weight[3]		48,420	50,999	56,625	51,983 r	54,448
Smelter output, Ni content of matte[4]		21,446	22,454	23,896	27,400 r	22,292
Salt[9]		184,753	178,646	315,259	229,432 r	208,319
Sand and gravel[10]	thousand cubic meters	93 r	207 r	2,401 r	1,485 r	2,330
Soda ash, natural		191,043	251,231	283,197	309,350	263,358
Stone, crushed	thousand cubic meters	1,070	2,141	1,201	1,060	1,219

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised.
[1]Table includes data available through October 2005.
[2]In addition to the commodities listed, platinum, palladium, and silver were produced, and exported in the nickel-copper-cobalt matte; copper and nickel cathodes also were produced at a pilot plant, but information was inadequate to estimate output.
[3]Smelter product was granulated nickel-copper-cobalt matte.
[4]Included some product from direct-smelting ore, that is, ore not reported as milled.
[5]Reported.
[6]Assumed to contain about 70% gem and near gem.
[7]Principally agate. Reported as sales.
[8]Reported as bullion; historically included silver estimated to be about 2%.
[9]Byproduct of natural soda ash production.
[10]Includes clay (for brick and tile).

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The Mineral Industry of Burundi

By Thomas R. Yager

Burundi, which is a small country in central Africa, was a producer of columbium (niobium) and tantalum ore, gold, tin ore, and tungsten ore, most of which was designated for export in 2004 (table 1). The country also produced limestone, peat, and sand and gravel for domestic consumption. Additionally, Burundi has resources of cobalt, copper, feldspar, nickel, phosphate rock, platinum-group metals (PGM), quartzite, rare-earth elements, uranium, and vanadium.

In 2004, Burundi's gross domestic product (GDP) based on purchasing power parity amounted to about $5.2 billion. The GDP rose by 5.5% in 2004 after falling by 1.2% in 2003. In 2002, manufacturing accounted for 8% of the GDP; construction, 4%; and mining and energy, about 1% (International Monetary Fund, 2004, p. 40; 2005b, p. 208; 2005§[1]).

Since 1993, civil unrest has led to economic stagnation and has been an important factor in preventing development of the proposed Musongati nickel resource project. In 2004, conflict continued between the Government and the Forces Nationales de Liberation.

Argosy Minerals Inc. of Australia reimposed force majeure at the Musongati nickel deposit in August 2004 because of the continuing political instability. The company was carrying out a feasibility study for an open pit mine at Musongati that would produce 45,000 metric tons per year (t/yr) of nickel, 7,500 t/yr of cobalt, and 2,500 t/yr of copper. Moto Goldmines Ltd. of Australia (formerly Equs Ltd.) explored for cobalt, copper, and nickel at Buhoro, Bukirasazi, and Rutovu (Argosy Minerals Inc., 2004; Songore, 2004).

In the northern part of the country, Comptoirs Miniers de Burundi S.A. (COMEBU) mined deposits of columbium (niobium) and tantalum. Production of columbite-tantalite fell to 24,382 kilograms (kg) in 2003 from 72,441 kg in 2002; the decline was attributable to low world market prices for tantalum oxide and high transportation costs. In 2003, COMEBU exported 14,769 kg of columbite-tantalite; Asyst Mines, 7,663 kg; and Hamza, 1,950 kg (Songore, 2004).

Artisanal miners produced gold from alluvial deposits. Burundi Mining Corp. held an exclusive gold exploration/mining permit for the entire Province of Muyinga. Burundi's gold production increased sharply in 2003 because of high world market prices for gold. In 2003, Matchanga Ltd. exported 2,771 kg of gold, and Interbee, 83 kg (Songore, 2004).

Artisanal miners mined small amounts of tin and tungsten. In 2003, Hamza exported 19,600 kg of wolframite (tungsten ore), and Habonimana, 13,188 kg. COMEBU exported 6,167 kg of cassiterite (tin ore), and Hamza, 2,600 kg. Mining of tin and tungsten reportedly contributed to environmental damage to the forest near Murehe (Republique du Burundi, 2004; Songore, 2004).

The state-owned Office National de la Tourbe produced and distributed peat for domestic consumption. In 2004, peat production increased to 4,643 metric tons (t) from 4,580 t in 2003 (Damien Riragonya, Director General of Geology and Mines, Burundi Ministry of Energy and Mines, written commun., July 18, 2005). Resources of peat were estimated to be 36 million metric tons, most of which were located in the Akanyara Valley near Buyongwe (table 3).

Burundi has no identified resources of coal, natural gas, or petroleum. The country does not have a refinery for petroleum products; all petroleum demand was met through imports. In 2003, Burundi's petroleum imports were valued at $30 million, or 22% of total imports (International Monetary Fund, 2005a, p. 26).

In 2004, the Governments of Burundi, the Democratic Republic of the Congo, and Rwanda discussed the rehabilitation of the Ruzizi I hydropower station. Repairs to Ruzizi I would increase capacity to 39.6 megawatts (MW) from 28.2 MW. The Governments also discussed the rehabilitation of Ruzizi II and the possible construction of Ruzizi III (Misser, 2004).

Burundi was landlocked and dependent upon its road network for external trade. The road network was damaged by the civil war. In March 2004, the World Bank approved a credit of $51.2 million to promote the rehabilitation of damaged roads (United Nations Integrated Regional Information Networks, 2004).

Outlook

Economic growth is expected to be 5% in 2005 and 2006 (International Monetary Fund, 2005b, p. 208). Strong GDP growth in 2005 and 2006 may lead to increased demand for such local construction materials as gravel, limestone, and sand. The outlook for columbium (niobium) and tantalum, gold, nickel, and tin depends heavily upon global market conditions and the resolution of political instability. Burundi's domestic market is limited by severe poverty.

References Cited

Argosy Minerals Inc., 2004, Reimposition of force majeure, Musongati, Burundi: Langley, British Columbia, Canada, Argosy Minerals Ltd. press release, August 20, 1 p.

International Monetary Fund, 2004, Burundi—Selected issues and statistical annex: Washington, DC, International Monetary Fund, February 17, 84 p.

International Monetary Fund, 2005a, Burundi—First review under the three-year arrangement under the poverty reduction and growth facility and request for waiver of performance criteria—Staff report; staff statement; press release on the Executive Board discussion; and statement by the Executive Director for Burundi: Washington, DC, International Monetary Fund, February 17, 71 p.

International Monetary Fund, 2005b, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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Misser, François, 2004, Energy projects may yet power a revival of Great Lakes co-operation: African Energy, no. 77, August, p. 7-8.
Republique du Burundi, 2004, Organisation a Kirundo d'un atelier regional sur la diversite biologique: Bujumbura, Burundi, Republique du Burundi press release, March 16, 1 p.
Songore, Tharcisse, 2004, Burundi, *in* Mining annual review 2004: London, United Kingdom, Mining Communication Ltd., CD-ROM.
United Nations Integrated Regional Information Networks, 2004, Burundi—World Bank approves $84 million credit for reconstruction: New York, New York, United Nations Integrated Regional Information Networks press release, March 24, 1 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Burundi, World Economic Outlook Database, accessed May 2, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

TABLE 1
BURUNDI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
Clays, kaolin		1,500	--	-- e	-- e	-- e
Columbium (niobium) and tantalum, ore and concentrate:						
Gross weight	kilograms	31,175	122,537	72,441	24,382	23,356
Nb content	do.	NA	NA	NA	4,300	4,100
Ta content	do.	8,200	32,230	14,500	5,769	5,700
Gold, mine output, Au content	do.	--	415	483	2,855	2,900 e
Peat		4,088	6,816	6,977	4,580	4,643
Tin, mine output, Sn content		6 r	3 r	--	5 r	10 e
Tungsten, mine output, W content		--	--	--	13 r	9

eEstimated; estimated data are rounded to no more than three significant digits. rRevised. NA Not available. -- Zero.
[1]Includes data available through July 18, 2005.

TABLE 2
BURUNDI: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Burundi Cement Plant[1]	Bujumbura	20,000.
Columbium (niobium) and tantalum	Comptoirs Miniers de Burundi S.A.	Kayanza and Kirundo Provinces	NA.
Gold	Burundi Mining Corp.[2]	Masaka	18,300 ore processing.
Do. kilograms	do.	do.	33 gold.
Peat	Office National de la Tourbe	Highland Bogs	20,000.
Tin	Artisanal miners	Murehe	NA.
Tungsten	do.	do.	NA.

NA Not available.
[1]Has not operated since 1996.
[2]Not operational in 2004.

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TABLE 3
BURUNDI: MINERAL RESOURCES IN 2004[1]

Commodity	Deposit	Tonnage	Grade	Mineral content
Cobalt, copper, and nickel	Musongati	185 Mt	1.31% Ni; 0.08% Co; 0.17% Cu	2.4 Mt Ni; 150,000 t Co; 310,000 t Cu.
Do.	Nyabikere	46 Mt	1.45% Ni; 0.031% Co; 0.012% Cu	670,000 t Ni; 14,000 t Co; 5,500 t Cu.
Do.	Waga	35 Mt	1.38% Ni; 0.048% Co; 0.028% Cu	480,000 t Ni; 17,000 t Co; 9,800 t Cu.
Gold	Masaka	8 Mt	1.8 g/t	14 t.
Do.	Other deposits in Muyinga Province	NA	NA	45 t.
Kaolin	Vyerwa	16 Mt	NA	NA.
Do.	Matongo	2.7 Mt	NA	NA.
Limestone	do.	1 Mt	NA	NA.
Peat	Akanyuru Valley	NA	NA	36 Mt.

NA Not available.
[1]Abbreviations used for commodities in this table include the following: Co--cobalt; Cu--copper; and Ni--nickel. Abbreviations used for units of measure in this table include the following: g/t--grams per metric ton; Mt--million metric tons; and t--metric tons.

Sources:
Burundi Ministry of Energy and Mines, 1991; Burundi mineral resources—An investment brochure: Bujumbura, Burundi, Burundi Ministry of Mines and Energy, 41 p.
Songore, Tharcisse, 1998, Burundi, *in* Mining annual review 1998: London, United Kingdom, Mining Communication Ltd., CD-ROM.
Songore, Tharcisse, 1999, Burundi, *in* Mining annual review 1999: London, United Kingdom, Mining Communication Ltd., CD-ROM.

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The Mineral Industries of Cameroon and Cape Verde

By Omayra Bermúdez-Lugo

CAMEROON

Cameroon is a West African country that borders the innermost bay of the Gulf of Guinea between Equatorial Guinea and Nigeria. The country's estimated 16 million inhabitants share a total land area of about 470,000 square kilometers (km^2) (U.S. Central Intelligence Agency, 2004§[1]). The petroleum sector is the most significant segment of Cameroon's mineral industry. Other commodities produced in the country were cement, clay, limestone, marble, pozzolana, primary aluminum, and sand and modest amounts of diamond and gold in placer deposits. A variety of industrial minerals and other construction materials, such as aggregates, gypsum, and stone, were also produced. Cameroon's undeveloped mineral resources include bauxite, cobalt, diamond, gold in lode deposits, granite, iron ore, nepheline syenite, nickel, and rutile (Ministry of Mines and Energy, 2004§). In 2004, the country's gross domestic product (GDP) at purchasing power parity was estimated to be $37.8 billion (International Monetary Fund, 2005§). Petroleum products accounted for about 35% of total exports. Other exports included aluminum, cocoa, and timber (Knopf, 2004).

The longstanding dispute between Cameroon and Nigeria concerning sovereignty over the Bakassi Peninsula once again caused conflict between the two countries. In 2002, the International Court of Justice had ruled in favor of Cameroon by granting the country sovereignty rights over the Peninsula, awarding other disputed parcels along the border to Nigeria, and ordering each country to pull its troops out of the land handed over to the other. A joint Cameroon-Nigerian commission to demarcate land boundaries and to resolve issues was formed in November 2002. Nigeria had agreed to remove its troops from the Lake Chad area in December 2003 and to hand over the entire Bakassi Peninsula to Cameroon on September 15, 2004. On September 13, 2004, Nigeria refused to withdraw its troops as agreed and demanded that a new withdrawal timetable be negotiated. This time, the cause of the dispute was the demarcation of the maritime boundary, which is believed to hold great petroleum potential owing to its proximity to producing oilfields in the area. The new conflict may bar petroleum companies, which have concessions in the area, from exploring offshore the peninsula (Africa Energy Intelligence, 2004a-c; UN Chronicle Online Edition, 2004§).

Structure of the Mineral Industry

In Cameroon, the Ministère des Mines de l'Eau et de l'Energie is responsible for the administration of the mineral industry in accordance with the Mining Law of 2001 and the Petroleum Code of 2000. Compagnie Camérounaise de l'Aluminium (Alucam) and its subsidiary Société de Camérounaise de Transformation de l'Aluminium S.A. operated an aluminum smelter and a rolling mill at Edea. Cimenteries du Cameroun ran two cement plants. Numerous local operations produced industrial minerals. State-owned Société Nationale des Hydrocarbures (SNH) was involved in hydrocarbon exploration and production with various joint ventures; partners included Addax Petroleum Cameroon Ltd., Amerada Hess Corp., Fusion Oil and Gas NL, Mobil Producing Cameroon, Pecten Cameroon Co., Perenco Cameroon S.A., Petronas Carigali Overseas Sdh. Bhd., Phillips Petroleum Co. Cameroon, RSM Production Corp., Total Exploration and Production Cameroon, and Tullow Cameroon Ltd. (Mobbs, 2003§).

Commodity Review

Metals

Aluminum.—The Government of Cameroon (53%) and Alcan Inc. of Canada (47%) coowned and operated the aluminum smelter of Alucam and the aluminum rolling mill of Société Camérounaise de Transformation de l'Aluminium at Edea. Alcan was considering increasing Alucam's capacity to 220,000 metric tons per year (t/yr) from its current capacity of 95,000 t/yr (Knopf, 2004).

Cobalt and Nickel.—In early 2004, Knight Piésold Ltd., which was a Canadian international environmental and geotechnical firm, was awarded the contract to prepare an environmental impact statement and environmental management plan for the Nkamouna property. The Nkamouna property hosted Geovic Cameroon S.A.'s (Geovic) cobalt-nickel project in East Province. The property hosted a lateritized serpentinite deposit for which Geovic (a subsidiary of Geovic Ltd. of the United States) was awarded a mining permit in December 2003. The company, which continued with its exploration and development program during 2004, planned to mine about 4 million metric tons per year (Mt/yr) of ore. Beneficiation from the run-of-mine ore was estimated to be about 1 Mt/yr of upgraded ore, which will be delivered to a leach plant to produce about 7,500 t/yr of cobalt and 4,700 t/yr of nickel (Geovic Ltd., 2004§).

Gold.—Small-scale artisanal miners recovered gold in eastern and northern Cameroon. Annual production was estimated to be about 1,500 kilograms per year (MBendi, 2005§).

Industrial Minerals

Diamond.—Annual diamond production was estimated to be 12,000 carats. Diamond is recovered throughout the country by small-scale artisanal miners (MBendi, 2005§).

[1]References that include a section mark (§) are found in the Internet References Cited sections.

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Mineral Fuels

Natural Gas.—Cameroon's natural gas reserves, which were located in the Doulala, the Kribi-Campo, and the Rio del Rey Basins, were estimated to be about 110 billion cubic meters (reported as 3.9 trillion cubic feet). In March 2004, Scottish company Euroil Ltd. and Oklahoma-based Syntroleum Corp. announced plans to begin developing the 17-billion-cubic-meter (reported as 600-billion-cubic-foot) Sanaga Sud Field offshore Cameroon (U.S. Energy Information Administration, 2004§).

Petroleum.—In 2004, Cameroon produced about 35 million barrels (Mbbl) of petroleum (table 1). According to the U.S. Energy Information Administration (2004§), Cameroon was sub-Saharan Africa's sixth leading petroleum producer. The country's petroleum reserves, which were estimated to be 400 Mbbl, are located offshore in the Rio del Rey Basin of the Niger Delta, offshore and onshore in the Douala/Kribi-Campo Basins on the western coast, and onshore in the Logone-Birni Basin in the northern part of the country.

Cameroon's only refinery, which was located in the port city of Limbe, was operated by Société Nationale de Raffinage and had a production capacity of 42,000 barrels per day (bbl/d) (U.S. Energy Information Administration, 2004§). Cameroon's petroleum production was exported. Petroleum used at the refinery was imported from Equatorial Guinea and Nigeria.

Cameroon Oil Transportation Company S.A. and Esso Exploration and Production Chad Inc. operated Cameroon's 870-kilometer (km) segment of the Chad-Cameroon crude petroleum pipeline. The pipeline, which began pumping its first oil in July 2003, runs from the Doba Basin in southern Chad to a marine terminal near Kribi in Cameroon. In 2004, average daily production was about 200,000 bbl. The pipeline's capacity was estimated to be about 225,000 bbl/d (U.S. Energy Information Administration, 2004§).

Infrastructure

An environmental impact study for a hydroelectric dam on the Lom River was underway during 2004. The dam would be located a few kilometers (km) downstream of the river's confluence with the Pangar River. The rivers are tributaries to Cameroon's Sanaga River, which provides more than 90% of the country's need for electricity. Construction work was scheduled to begin in 2008 (afrol News, 2004§).

Outlook

Cameroon's mineral industry will continue to be dominated by the petroleum industry in the immediate future. If no new petroleum discoveries are made and average production continues at the 2004 rate, then petroleum resources might last for about 11 years. This would seriously affect the country's economy given that petroleum accounts for about 35% of total exports.

References Cited

Africa Energy Intelligence, 2004a, Bakassi still no-go region: Africa Energy Intelligence, no. 376, September 8–21, p. 4.

Africa Energy Intelligence, 2004b, New meeting on Bakassi: Africa Energy Intelligence, no. 379, October 20–November 2, p. 2.

Africa Energy Intelligence, 2004c, New stalemate on Bakassi: Africa Energy Intelligence, no. 380, November 3–16, p. 2.

Knopf, David, 2004, Cameroon, in Mining Annual Review: London, United Kingdom, Mining Communication Ltd., CD-ROM.

Internet References Cited

afrol News, 2004 (April 29), Cameroon orders environmental study of dam project, accessed May 3, 2005, at URL http://www.afrol.com/articles/12138.

Geovic Ltd., 2004, Cobalt-nickel-manganese mining project East Province, Cameroon, accessed April 29, 2005, at URL http://www.geovic.net/Geovic_Co_Project_Update.pdf.

International Monetary Fund, 2005 (April), Cameroon, World Economic Outlook Database, accessed April 25, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

MBendi, 2005, Cameroon mining overview, accessed April 29, 2005, at URL http://www.mbendi.co.za/indy/ming/af/ca/p0005.htm.

Ministry of Mines and Energy, 2004, Cameroon's mineral resources, accessed April 29, 2005, at URL http://www.camnet.cm/investir/minmee/resmine.htm.

Mobbs, P.M., 2003, The mineral industries of Cameroon and Chad, v. III *of* U.S. Geological Survey Minerals Yearbook 2003, accessed August 16, 2005, at URL http://minerals.usgs.gov/minerals/pubs/country/2003/cmcdmyb03.pdf.

UN Chronicle Online Edition, 2004, Nigeria and Cameroon try to settle Bakassi Peninsula dispute, accessed April 27, 2005, at URL http://www.un.org/Pubs/chronicle/2004/webArticles/032004_Bakassi.asp.

U.S. Central Intelligence Agency, 2004, Cameroon, World Factbook 2004, accessed March 31, 2004, at URL http://www.cia.gov/cia/publications/factbook/geos/cm.html.

U.S. Energy Information Administration, 2004 (December), Chad and Cameroon, Country Analysis Brief, accessed December 21, 2004, at URL http://www.eia.doe.gov/emeu/cabs/chad_cameroon.html.

CAPE VERDE

Cape Verde is an archipelago of 10 islands and 8 islets located about 600 km off the West Coast of Africa. The country's estimated 415,000 inhabitants share a total land area of about 4,033 km^2 (U.S. Central Intelligence Agency, 2004§). In 2004, mining continued to play a minor role in the country's economy. Production of mineral commodities was limited to the production of clay on the islands of Boa Vista, Sal, and São Vicente; gypsum on the island of Maio; limestone on the islands of Boa Vista, Sal, and Santo Antão; pozzolana on the island of Santo Antão; and salt on the islands of Mindelo and Sal. Cape Verde's GDP at purchasing power parity was estimated to have been $2.75 billion in 2004 compared with $2.4 billion in 2003 (International Monetary Fund, 2005§). On the basis of 2003 statistics, exports were valued at $54 million and consisted mainly of bananas, fish, and manufactured products (World Bank, 2004§).

Commodity Review

Industrial Minerals

Cement.—Cape Verdean and Italian investors (not identified) began the construction of a 40,000 t/yr cement plant in Porto Novo. The plant, which will use pozzolanic materials from Santo Antão Island and imported clinker from Italy, was expected to cost $5 million and to begin operation in 2005 (Cabo Verde 24, 2004b§).

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Mineral Fuels

Petroleum.—Cape Verde is not a petroleum producer. In November 2004, the President of Angola visited Cape Verde to discuss the possibility of conducting petroleum exploration offshore Cape Verde. Principal companies interested in exploring Cape Verde's territorial waters were Sociedade Nacional de Combustíveis de Angola (Sonangol) and Petróleo Brasileiro S.A. of Brazil (Cabo Verde 24, 2004a§; Miranda Correia Amendoeira & Associados, 2005§). Sonangol planned to construct its local headquarters on the island of Sal during 2004. The project was estimated to cost $1.5 million (Africanidade, 2004§; Cabo Verde 24, 2004c§).

Infrastructure

The Cape Verdean Highway Institute, which was created in 2004, was working on the approval of the National Highway Plan; this project was aimed at classifying the country's roads and defining the responsibilities of those who will manage them. The Highway Institute planned to construct new roads on several of the country's islands at a total cost of $30 million, which would be financed by the World Bank. In addition, the Arab Bank for Economic Development in Africa planned to construct a number of roads on the islands of Boa Vista and Santo Antão, a highway that will run the circumference of the island of Fogo, a road that will link Nossa Senhora do Monte to Tantum on the island of Brava, and a number of small roads on the island of Santiago (Cabo Verde 24, 2004d§).

In July 2004, the United States Trade and Development Agency (2004) awarded Empresa Nacional de Administraçao dos Portos, S.A. (ENAPOR) a $420,000 grant to fund a feasibility study for a transshipment port in Cape Verde. ENAPOR was the Government entity responsible for the management and modernization of Cape Verde's port infrastructure.

Outlook

The interest of foreign companies in petroleum exploration offshore Cape Verde in 2004 suggests that the growth potential of Cape Verde's mineral industry will likely rely on the development of the energy sector if petroleum discoveries are made.

Reference Cited

United States Trade and Development Agency, 2004, USTDA grant supports port development in Cape Verde: Praia, Cape Verde, United States Trade and Development Agency press release, July 1, 2 p.

Internet References Cited

Africanidade, 2004, Sede da Sonangol pronta em Janeiro 2005, accessed April 25, 2005, at URL http://www.africanidade.com/?lop=n_artigo&op=a87ff679a2f3e71d9181a67b7542122c&id=fb4ab556bc42d6f0ee0f9e24ec4d1af0.

Cabo Verde 24, 2004a, Angolan, Cape Verde leaders to discuss cooperation in oil exploitation, accessed April 21, 2005, at URL http://www.caboverde24.com/news.asp?ID=340.

Cabo Verde 24, 2004b, Cape Verde gets new cement factory, accessed April 21, 2005, at URL http://www.caboverde24.com/news.asp?ID=418.

Cabo Verde 24, 2004c, Foreign investment up in first semester, accessed April 21, 2005, at URL http://www.caboverde24.com/news.asp?ID=398.

Cabo Verde 24, 2004d, Highway plan and new roads, accessed April 21, 2005, at URL http://www.caboverde24.com/news.asp?ID=409.

International Monetary Fund, 2005 (April), Cape Verde, World Economic Outlook Database, accessed April 25, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

Miranda Correia Amendoeira & Associados, 2005, Petroleum exploration in Cape Verde may start this year, accessed April 27, 2005, at URL http://www.mirandalawfirm.com/indexnews.asp?ID=187.

U.S. Central Intelligence Agency, 2004 (January 1), Cape Verde, World Factbook 2004, accessed March 31, 2004, at URL http://www.cia.gov/cia/publications/factbook/geos/cv.html.

World Bank, 2004 (September), Cape Verde at a glance, accessed April 27, 2005, at URL http://www.worldbank.org/data/countrydata/aag/cpv_aag.pdf.

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TABLE 1
CAMEROON AND CAPE VERDE: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Country and commodity		2000	2001	2002	2003	2004[e]
CAMEROON[3]						
Aluminum metal, primary		86,384 [4]	80,900 [4]	67,000 [r]	77,200 [r]	85,900 [4]
Cement, hydraulic		890,000 [4]	930,000 [4]	950,000	930,000	930,000
Clay		21,558 [4]	22,000	22,000	22,000	22,000
Diamond[5]	carats	NA	NA	NA	NA	12,000
Gold, mine output, Au content[5]	kilograms	1,000	1,000	1,000	1,500 [r]	1,500
Petroleum:						
Crude	thousand 42-gallon barrels	32,100	29,200	26,280 [r, 4]	24,820 [r, 4]	34,675 [4]
Refinery products	do.	15,000	12,000	12,000	12,000	12,000
Pozzolana, ash for cement		604,960 [4]	600,000	620,000	600,000	600,000
Sand		35,078 [4]	35,000	40,000	35,000	35,000
Stone:						
Limestone		258,517 [4]	260,000	260,000	260,000	260,000
Marble		21,165 [4]	20,000	20,000	20,000	20,000
CAPE VERDE[6]						
Salt		1,600	1,600	1,600	1,600	1,600

[r]Revised. NA Not available.
[1]Includes data available through May 3, 2005.
[2]Estimated data are rounded to no more than three significant digits.
[3]In addition to the commodities listed, a variety of industrial minerals and construction materials (aggregate, gypsum, and stone) are produced, and bauxite may be produced, but information is inadequate to make reliable estimates of output.
[4]Reported figure.
[5]From artisanal mining.
[6]Cape Verde also presumably produced clay, gypsum, limestone, and pozzolana, but output is not reported, and available information is inadequate to make estimates of output levels.

TABLE 2
CAMEROON AND CAPE VERDE: STRUCTURE OF THE MINERAL INDUSTRIES IN 2004

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies and and major equity owners	Location of main facilities	Annual capacity
CAMEROON				
Aluminum, metal:				
Primary		Compagnie Camérounaise de l'Aluminium (Government, 53%, and Alcan, Inc., 47%)	Smelter at Edea	95,000
Secondary		do.	Edea	8,000 [1]
Aluminum, products		Société de Camérounaise de Transformation de l'Aluminium S.A. (Alcan Inc., 53%; Government, 42%; Aluminium Pechiney, 5%)	Rolling mill at Edea	NA
Cement		Cimentaries du Cameroun (Lafarge Group, 57%)	Bonaberi Mill near Douala and the Figuil kiln and mill at Garoua	1,100,000
Gold	kilograms	Artisanal placer operations	Various locations	1,500
Petroleum, crude	42-gallon barrels per day	Total Exploration and Production Cameroun (Total S.A., 100%)	About 21 oilfields, which included Bavo, Ekoundou Horst, Eloundou, Eloundou Nord Marine, Ekoundou Sud, Itindi, and Kombo Centre	500,000
Do.	do.	Pecten Cameroon Co. (Pecten International, 80%, and Société Nationale des Hydrocarbures, 20%)	Makoko Northeast and Makoko South Marine Fields	NA
Do.	do.	Perenco Cameroon S.A. (Perenco Group, 100%)	Ebome and Moudi Fields	10,500
Petroleum products	do.	Société Nationale de Raffinage (Government, 66%)	Refinery at Limbe	42,000
CAPE VERDE				
Salt		Groupe Salins de France (private, 100%)	Mindelo and Sal Islands	2,000

NA Not available.
[1]May include aluminum alloys.

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The Mineral Industries of Central African Republic, Côte d'Ivoire, and Togo

By Omayra Bermúdez-Lugo

CENTRAL AFRICAN REPUBLIC

Central African Republic was a producer of diamond, gold, and small amounts of kaolin and quartz crystals. Identified mineral occurrences in the country included copper, graphite, ilmenite, iron ore, kyanite, lignite, limestone, manganese, monazite, rutile, salt, tin, and uranium. In 2004, the country's gross domestic product (GDP) at purchasing power parity was estimated to be about $4.6 billion (International Monetary Fund, 2005§[1]). The population was estimated to be about 3.7 million (U.S. Central Intelligence Agency, 2005§).

In 2004, diamond production rose to about 350,000 carats from 332,700 carats in 2003. Diamond was produced from alluvial deposits in the north. Diamond exports amounted to 349,451 carats at a value of $51.6 million. Uncut diamond made up nearly 60% of export earnings (Harben, 2004).

Energem Resources Inc., formerly known as Diamondworks Ltd., of Canada (name changed in May 2004) relinquished some of the properties that it had held under concession in the country, but kept the Bangana, Bria, Kotto, and Ouadda alluvial diamond mining areas. Mining licenses had been temporarily suspended in 2003 following the overthrow of the Government. In 2004, the rights to the concessions kept by Energem were reconfirmed by the relevant authorities and the company recommenced prospecting in May 2004 (Energem Resources Inc., 2004, p. 4-5).

Vaaldiam Resources Ltd. of Canada was granted an exploration permit for the Haute Kotto alluvial diamond mining area. The company's plans to explore for diamond at its Central African Republic Kimberlite Project were on hold during the year as the company focused on other priority exploration areas in Brazil (Vaaldiam Resources Ltd., 2005).

Gold was produced by artisanal miners from the Bandas and the Bogoin-Boali greenstone belts. Axmin Inc. of Canada continued to explore for gold in the country. In March 2004, the company was granted a renewal of its 100%-owned Bambari permit. The four gold prospects delineated at Bambari were the Ao, the Louba, the Ndassima, and the Passendro gold prospects. At least six gold targets had been delineated at Passendro; these included the Baceta, the French Camp, the Katsia, the Main Zone, the Ngetepe, and the Ngodo. The company reported the indicated resource at French Camp to be 2.38 million metric tons (Mt) at a grade of 3.4 grams per metric ton (g/t) gold and the inferred resource to be 0.22 Mt at a grade of 2.4 g/t gold. The indicated resource at Katsia was reported to be 1.65 Mt at a grade of 3.7 g/t gold and the inferred resource to be 1.1 Mt at a grade of 3.6 g/t gold. The inferred resource at Main Zone was reported to be 17 Mt at a grade of 1.6 g/t gold. The company planned to drill the Ao and the Ndassima areas in early 2005 (Axmin Inc., 2004§).

Central African Republic did not produce mineral fuels in 2004 and depended upon imports for its energy requirements. In September 2004, United Reef Limited of Canada obtained the rights to a petroleum exploration permit in Central African Republic through a farm-in agreement with Denver-based RSM Production Corporation (RSM), which was a subsidiary of Grynberg Petroleum of the United States. The exploration permit was for the Doseo and the Salamat Basins in the northern part of the country. According to United Reef, a total of 18 prospects had been identified in the Salamat Basin. No prospects had been identified in the Doseo Basin. After meeting the terms of the farm-in agreement, the company will have the option to acquire a 25% working interest in RSM's exploration permit. United Reef planned to conduct a seismic program in 2005 and will begin its drilling program as early as the fourth quarter of 2005 (Paul A. MacKay Geoconsultants Ltd., 2004, p. 1, 3, 5).

Outlook

The successful development of Central African Republic's mining industry will depend upon the country reaching political stability in the near future and the Government's willingness to allow foreign companies to continue with their diamond, gold, and petroleum exploration programs.

References Cited

Energem Resources Inc., 2004, Management discussion and analysis of financial condition and results of operations for the quarter ended August 31, 2004: Yukon, Canada, Energem Resources Inc., 5 p.

Harben, P.W., and Harris, J.M., 2004, Central African Republic, *in* Mining Annual Review: London, United Kingdom, Mining Communications Ltd., CD-ROM.

Paul A. MacKay Geoconsultants Ltd., 2004, Report on the petroleum potential of the RSM production corporation oil and gas permit area in the northeastern portion of the Central African Republic: Calgary, Alberta, Canada, Paul A. MacKay Geoconsultants Ltd., 22 p.

Vaaldiam Resources Ltd., 2005, Management discussion and analysis for the quarter ended March 31, 2005: Toronto, Ontario, Canada, Vaaldiam Resources Ltd., 14 p.

Internet References Cited

Axmin Inc., 2004, Bambari permits, CAR-operations, accessed August 10, 2005, at URL http://www.axmininc.com/DesktopDefault.aspx?tabid=138.

International Monetary Fund, 2005 (April), Central African Republic, World Economic Outlook Database, accessed August 9, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

[1]References that include a section mark (§) are found in the Internet References Cited sections.

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U.S. Central Intelligence Agency, 2005, Central African Republic, World Factbook 2004, accessed March 31, 2005, at URL http://www.cia.gov/cia/publications/factbook/geos/ct.html.

CÔTE D'IVOIRE

Côte d'Ivoire was a producer of cement, clay, columbium (niobium) and tantalum, diamond, gold, gravel and crushed rock, manganese, natural gas, crude petroleum and petroleum products, sand, and sulfuric acid. The country also had deposits of bauxite, cobalt, copper, iron ore, nickel, and silica sand.

According to the United Nations Office for the Coordination of Humanitarian Affairs (2004§), Côte d'Ivoire almost relapsed into civil war during 2004 after the Government violated the ceasefire agreements it had signed with rebel groups in 2002 and 2003. Violence erupted in March after the Government banned opposition demonstrations in Abidjan and in November when French peacekeeping troops attacked the Ivorian air force in retaliation for an Ivorian raid on rebel-held cities to the north of the country and an attack on a French military base by rioters (United Nations Office for the Coordination of Humanitarian Affairs, 2004§; U.S. Department of State, 2005§).

The Ivorian economy was largely dependent on agriculture. Cocoa and coffee accounted for about 40% of export earnings in 2004. The mining sector grew by 29% during the year owing to an increase in petroleum production. Gold output decreased as a result of the closing of the Angovia gold mine (Organisation for Economic Co-operation and Development, 2005, p. 194-196). In 2004, Côte d'Ivoire's gross domestic product at purchasing power parity was estimated to be about $26.6 billion (International Monetary Fund, 2005§). The population was estimated to be 16.9 million (Organisation for Economic Co-operation and Development, 2005, p. 192).

Metals

In 2004, gold production fell to 1,219 kilograms (kg) from 1,313 kg in 2003. The decrease in output was attributed to the closure of the Angovia Mine. Gold production came from the Ity Mine, which was owned by the Cie. Générale Des Matieres Nucleaires Group (COGEMA) of France (51%) and state-owned Société pour le Développement Minier en Côte d'Ivoire (SODEMI) (49%). The Ity Mine is located at the border of the buffer zone between the northern part of the country, which is controlled by the Forces Nouvelles rebel group, and the southern part of the country, which is controlled by Les Forces Armées Nationales de Côte d'Ivoire (FANCI), which are the national armed forces. The buffer zone is controlled by the French Army. The Ity Mine had stopped production in 2003 after rebel groups took over the mining site in late 2002. Ity mining company vehicles were seized by the FANCI during the November 2004 incident, but were later returned. The Forces Nouvelles have denied Ity access to the mine from the north via the Zouart-Hounien-Danane-Man road, which delayed the delivery of cyanide and cement supplies to the mine (Africa Mining Intelligence, 2005).

Equigold NL of Australia through its subsidiary Equigold Côte d'Ivoire S.A. held a 94% interest in five gold exploration permits. The permits were for the Bassawa, the Didievi, the Kokoumbo, the Oume, and the Timbe properties, which are located within the country's Oume-Fetekro Proterozoic greenstone belt. In 2004, a drilling program was completed at the Bonikro gold deposit, which is located on the Oume property. The company reported a new resource estimate for Bonikro of 25 Mt of ore at a grade of 1.6 g/t gold and a cutoff grade of 0.6 g/t gold. Equigold planned to complete a feasibility study for Bonikro in 2005 (Equigold NL, 2005, p. 10-11).

Randgold Resources Ltd. of the United Kingdom held the Boundiali, the Dabakala, the Mankono, the Nielle, and the Sikolo properties. Rangold reported that it had temporarily suspended its exploration activities in Côte d'Ivoire during 2004 owing to the outbreak of civil unrest in the country. The company's Tongon project, which was located within the Nielle property about 620 kilometers (km) north of Abidjan, was on hold in 2004. Randgold signed a standstill agreement with the Government and reported that it would not resume work at Tongon until the country reached political stability, the Government guaranteed the security of personnel and equipment, and Randgold had full access to the project through basic transportation routes (Randgold Resources Ltd., 2005, p. 10, 29). Following a prefeasibility study for Tongon, which was completed in 2001, the company reported an inferred resource of 34 Mt of ore at a grade of 2.6 g/t gold. The mineral resource estimate was based on 62 drill holes in the target area, of which 35 were diamond drill holes and 27 were reverse circulation holes at a drill spacing of 50 to 100 meters (m) in the southern zone and 150 to 300 m in the northern zone. Mineralization was found at a depth of 120 m, and the resource was calculated using a 0.5 g/t cutoff grade. Randgold envisioned an open pit operation with a 200,000 metric-ton-per-month (t/mo) recovery plant for the sulfide and a 240,000-t/mo recovery plant for the oxide. Metallurgical testwork indicated a recovery rate of 95% gold for the oxide and 82% for the sulfide (Randgold Resources Ltd., 2005, p. 31-32).

Etruscan Resources Inc. of Canada held an exploration permit for the Agbaou gold deposit, which is located about 200 km northwest of the Port of Abidjan. The deposit is accessible through a paved highway and is located within 2 km of the national power grid. The exploration permit was granted to Etruscan in November 2003. An independent resource estimate prepared by RSG Global of Australia in 2000 reported an indicated gold resource of 18.24 Mt at an average grade of 1.5 g/t gold using a cutoff grade of 0.5 g/t. Etruscan announced that it was unable to begin its planned drilling program in 2004 because of political instability in the country (Etruscan Resources Inc., 2005, p. 6).

Cluff Gold plc. of the United Kingdom held an exploration permit for the Mt. Yaoure property, which is located about 40 km north of Yamoussoukro. The property includes the recently closed Angovia gold mine, which operated between 1998 and 2003. In 2004, the company purchased exploration data from Cominor S.A. (a subsidiary of COGEMA), which included drill assay results that identified satellite gold deposits in the vicinity of the Angovia gold mine. Previous Cominor reports indicated a resource of 900,000 metric tons (t) of ore at a grade of 3.7 g/t gold. Cluff Gold planned to acquire most of the oxide

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processing plant at Angovia from the Government (Cluff Gold plc., 2005, p. 6-7).

Industrial Minerals

Kimberlites were known to occur at Kanangone, Seguela, and Tortiya; diamond was produced only from alluvial deposits at Seguela and Tortiya. In late November 2004, the Kimberley Process Chair issued a notice that countries participating in the Kimberley Process were not to accept shipments of rough diamond from Côte d'Ivoire. The ban was in response to the Government's report that the diamond-producing areas of Seguela and Tortiya were under rebel control and that a ministerial order was in effect that prohibited all exports of rough diamond from Côte d'Ivoire and suspended the issuance of Kimberley Process Certificates (Kimberley Process, 2005§).

Mineral Fuels

A consortium formed by Canadian Natural Resources Ltd. (CNR), Société Nationale d'Operations Petrolieres de la Côte d'Ivoire (PETROCI), and Tullow Oil plc of the United Kingdom produced natural gas from the East Espoir oilfield. According to the U.S. Energy Information Administration (2005§), about 93% of Côte d'Ivoire's oil and gas wells are located offshore. CNR held several exploration blocks offshore Côte d'Ivoire. In 2004, the company continued with the development of its Baobab oilfield and announced that it expected the first oil production to start by mid-2005 at a rate of 24,000 barrels per day (bbl/d) and to reach 35,000 bbl/d by 2006. CNR planned to continue with its exploration program for its other lease holdings in the country in 2005 (Canadian National Resources Ltd., 2005, p. 35).

In December 2004, Vanco Energy Co. of the United States through its subsidiary Vanco Côte d'Ivoire Ltd. announced that it had contracted the Transocean Deepwater Discovery drillship to drill the San Pedro prospect in early 2005. The San Pedro prospect is located within Block CI-112. Vanco Côte d'Ivoire was the operator and held a 27% interest in the block. The remaining partners in the block were Sinopec Overseas Oil & Gas Ltd. of China (27%), Indian National Oil Companies ONGC Videsh Ltd. (21.15%), Oil India Limited (10.35%), and Pétrolières de la Côte d'Ivoire (14.5%) (Vanco Energy Co., 2004§). Société Ivorienne de Raffinage operated Côte d'Ivoire's only petroleum refinery; Societe Multinationale des Bitumes operated an asphalt plant.

Outlook

The growth potential of Côte d'Ivoire's mining industry depends on the country's future political stability. Presidential elections were to be held in 2005.

References Cited

Africa Mining Intelligence, 2005, Cogema calls back its expats: Africa Mining Intelligence, no. 99, p. 3.

Canadian Natural Resources Ltd., 2005, 2004 annual report: Calgary, Alberta, Canada, Canadian Natural Resources, 100 p.

Cluff Gold plc., 2005, 2004 annual report: London, United Kingdom, Cluff Gold plc., 30 p.

Equigold NL, 2005, 2004 annual report: Applecross, Western Australia, Equigold NL, 53 p.

Etruscan Resources Inc., 2005, 2004 annual report: Windsor, Nova Scotia, Canada, Etruscan Resources Inc., 40 p.

Organisation for Economic Co-operation and Development, 2005, 2004/2005 African Economic Outlook: Paris, France, Organisation for Economic Co-operation and Development, 540 p.

Randgold Resources Ltd., 2005, 2004 annual report: St. Helier, Jersey, United Kingdom, Randgold Resources Ltd., 96 p.

Internet References Cited

International Monetary Fund, 2005 (April), Côte d'Ivoire, World Economic Outlook Database, accessed August 9, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

Kimberley Process, 2005, Quarterly reports, accessed August 22, 2005, at URL http://www.kimberleyprocess.com:8080/site/www_docs/chairs1/chair4quarterreport.pdf.

United Nations Office for the Coordination of Humanitarian Affairs, 2004 (December 28), Côte d'Ivoire—Lingering crisis still threatens regional stability, accessed August 16, 2005, at URL http://www.irinnews.org/print.asp?ReportID=44826.

U.S. Department of State, 2005, Côte d'Ivoire 2005 investment climate statement, accessed August 18, 2005, at URL http://www.state.gov/e/eb/ifd/2005/43023.htm.

U.S. Energy Information Administration, 2005 (July), Côte d'Ivoire, Country Analysis Brief, accessed July 21, 2005, at URL http://www.eia.doe.gov/emeu/cabs/cdivoire.html.

Vanco Energy Co., 2004, Vanco announces drilling plans for block CI-112, offshore Côte d'Ivoire, accessed December 19, 2004, via URL http://www.vancoenergy.com.

TOGO

Togo was a producer of cement, clinker, diamond, gold, limestone, and phosphate rock. The country also had resources of bauxite, gypsum, iron ore, manganese, marble, rutile, and zinc. The Ministère de l'Equipment, des Mines, de l'Energie et des Postes et Telecommunications was responsible for the administration of the mining sector. In 2004, the country's GDP at purchasing power parity was estimated to be about $8.48 billion (International Monetary Fund, 2005§). Agriculture, which accounted for about 41% of the GDP in 2004, was Togo's main economic activity followed by industry, which accounted for about 24% of the GDP. Most of the industrial activity in the country was limited to phosphate rock production (Ministry of External Affairs of India, 2005§). The population was estimated to be about 5.6 million (U.S. Central Intelligence Agency, 2005§).

Ciments du Togo and West African Cement Company produced cement. West African Cement Company produced about 1 million metric tons per year of clinker, most of which was exported. The company operated a limestone quarry at Tabligbo; limestone from the quarry was exported to Diamond Cement Factory in Ghana. Resources at Tabligbo were estimated to be more than 175 Mt (Palut, 2004). Limestone was produced from the Tabligbo deposit, which was located about 60 km northeast of Lome.

Togo's production of phosphate rock decreased to 1.115 Mt in 2004 from 1.471 Mt in 2003 (table 1). The International Fertilizer Group Togo, which was a 50-50 joint venture between the Government of Togo and Brifco Ltd. of France, was the

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company in charge of phosphate rock production. Phosphate rock resources were mostly from coastal sedimentary deposits, which minimized transportation costs for processing and export. The phosphate rock being produced from these deposits however, had a high content of cadmium [about 150 milligrams per kilogram (mg/kg)]. Other cadmium-free resources have been identified to the northwest, but were not being mined (Ministry of External Affairs of India, 2005§). Phosphate rock reserves were estimated to be about 260 Mt (Palut, 2004).

Togo did not produce or refine petroleum and depended upon imports to satisfy its petroleum requirements. Togo Hunt Oil Co., a subsidiary of Hunt Oil Co. of the United States, was actively exploring for petroleum offshore.

The Government's of Benin and Togo planned to construct a 100-megawatt hydroelectric plant at Adjarala in the Mono Valley, which is located on Togo's southern border with Benin. The project will include a 50-m-high dam (afrolNews, 2004§).

Outlook

According to the Ministry of External Affairs of India (2005§) the European Union, which is Togo's principal phosphate rock export market, planned to put a cadmium content ceiling of 60 mg/kg of phosphate rock imports within 5 years and 20 mg/kg of phosphate rock within 15 years. These limits could greatly affect Togo's economy given that about 24% of its GDP is from the export of phosphate rock and the mining of its cadmium-free phosphate rock resources was not commercially viable as of 2004.

Reference Cited

Palut, Jean-Pierre, 2004, Togo, *in* Mining Annual Review 2004: London, United Kingdom, Mining Communications Ltd., CD-ROM.

Internet References Cited

afrolNews, 2004, Benin, Togo enhance power supply cooperation, accessed May 3, 2005, at URL http://www.afrol.com/printable_article/11343.

Ministry of External Affairs of India, 2005, Basic facts about Togo, accessed August 19, 2005, at URL http://meaindia.nic.in/foreignrelation/togo.pdf.

International Monetary Fund, 2005 (April), Togo, World Economic Outlook Database, accessed August 9, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

U.S. Central Intelligence Agency, 2005, Togo, World Factbook 2004, accessed March 31, 2005, at URL http://www.cia.gov/cia/publications/factbook/geos/to.html.

TABLE 1
CENTRAL AFRICAN REPUBLIC, CÔTE D'IVOIRE, AND TOGO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2000	2001		2003[e]	2004[e]
CENTRAL AFRICAN REPUBLIC						
Diamond	carats	464,000	452,700	416,400	332,700 [2]	350,000 [p]
Gold	kilograms	15	34	16	7 [r]	7
CÔTE D'IVOIRE[3]						
Cement[e]		650,000	650,000	650,000	650,000	650,000
Columbium (niobium) and tantalum:						
Columbite	kilograms	137	130 [e]	130 [e]	130	130
Tantalite	do.	408	400 [e]	400 [e]	400	400
Diamond	carats	320,207	309,000	306,500	230,000	230,000
Gold	kilograms	3,444	3,672	3,570	1,313 [2]	1,219 [2]
Gravel and crushed rock		540,000	550,000 [e]	550,000 [e]	550,000	550,000
Natural gas	million cubic meters	1,146	1,062	1,610	1,457 [2]	1,500
Petroleum:						
Crude	thousand 42-gallon barrels	2,578	2,099	5,495	6,767 [r]	7,434 [2]
Refinery products[e]	do.	20,100	19,500	19,000	19,000	19,000
Sand[e]		740,000	750,000	750,000	750,000	750,000
Sulfuric acid		3,000	3,000	3,000	3,000	3,000
TOGO[4]						
Cement:[e]						
Clinker		1,000,000	1,000,000	1,000,000	1,200,000	1,200,000
Hydraulic[5]		700,000	800,000	800,000	800,000	800,000
Limestone		2,400,000	2,400,000 [e]	2,400,000 [e]	2,400,000	2,400,000
Phosphate rock, beneficiated product:						
Gross weight	thousand metric tons	1,370	1,067	1,271	1,471 [2]	1,115 [2]
P_2O_5 content[e]	do.	490	380	460	530	418 [2]

[e]Estimated; estimated data are rounded to no more than three significant digits. [p]Preliminary. [r]Revised.

[1]Includes data available through August 23, 2005.

[2]Reported figure.

[3]In addition to the mineral commodities listed, Côte d'Ivoire produced clay, crushed granite, manganese, and stone, but information is inadequate to make estimates of output levels.

[4]Togo also presumably produced diamond and gold, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[5]Includes cement produced from imported clinker.

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TABLE 2
CÔTE D'IVOIRE AND TOGO: STRUCTURE OF THE MINERAL INDUSTRIES IN 2004

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
CÔTE D'IVOIRE				
Cement		Société des Ciments d'Abidjan (Government, 40%; Ominum Tropical, 24%; SCOA Côte d'Ivoire SA, 12%)	Abidjan plant	750,000.
Do.		Société Ivorienne de Ciment et Materiaux (Holcim and Origny, 80%)	do.	500,000.
Do.		Société des Ciments du Sud-Ouest (Government and Omnium Tropical)	San Pedro	100,000.
Gold		Société des Mines d'Ity (Cie. Générale des Matieres Nucleaires Group, 51%, and Société pour le Développement Minier en Côte d'Ivoire, 49%)	Ity Mine	450,000 ore.
Do.	kilograms	do.	do.	2,250 gold.
Do.	do.	do.	do.	1,200 gold.
Petroleum products	thousand 42-gallon barrels	Société Ivorienne de Raffinage	Abidjan	23,800.
TOGO				
Cement		Ciments du Togo (Scancem International, 99.6%)	Lomé plant	800,000 cement.
Do.		West African Cement Company (Indian Kenyan Co., 100%)	Tabligbo	1,000,000 cement; 1,200,000 clinker.
Limestone		Ciments de l'Afrique de l'Ouest (private, 100%)	do.	2,400,000.
Phosphate rock		International Fertilizer Group Togo (Government, 50%, and Brifco Ltd. 50%)	Akoumape and Hahotue	2,000,000.

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The Mineral Industry of Chad

By Philip M. Mobbs

Chad is Africa's newest petroleum-producing country. The recent development of petroleum resources significantly increased the relevance of mineral resources to the nation's economy, which had been dominated by commerce and trade [24.6% of the gross domestic product (GDP) in 2002 (the last year for which detailed data were available)], agriculture (17.6%), and livestock (16.6%). The impact of the mineral sector on employment was minimal, especially with the completion of the Chad-Cameroon oil pipeline in 2003 and subsequent demobilization of the construction crews; subsistence farming still employed 80% of the total population, which was estimated to be about 9 million in 2004. Chad remained the focus of international attention to see if revenue derived from the development of the country's oil resources will be managed to benefit the nation and its population or if the country will be the latest example of the dissolution of wealth from natural resource development (Gary and Reisch, 2005, p. 4-12; Georgiou and others, 2004, p. 6-7; International Finance Corp., 2004a; International Monetary Fund, 2005, p. 24; Sachs and Warner, 1995, p. 1-7; World Bank Group, 2004; Pegg, 2005§[1]; Spera, 2004§).

Landlocked Chad shares borders with the central African countries of Cameroon, the Central African Republic, Libya, Niger, Nigeria, and Sudan. Chad was the fifth largest country in Africa with an area of 1,284,999 square kilometers (km^2). In 2004, the GDP at current prices was estimated to have increased to about $4.2 billion.[2] As a result of the first full year of crude oil production and exportation, real GDP increased at an annual rate of 30.7% compared with 9.7% in 2003. The growth placed Chad second on the list of greatest annual percent change of real GDP in 2004 after Equatorial Guinea. The International Monetary Fund (2005§) reported that Chad's GDP based on purchasing power parity was more than $13.4 billion in 2004 and that GDP per capita based on purchasing power parity was $1,627.

Since the initiation of oil production in 2003, oil has overshadowed the limited suite of other produced mineral commodities, which include aggregates, clay, gold, lime, limestone, natron (soda ash), salt, sand, and stone. In addition to these commodities, previous geologic studies in Chad have identified a variety of mineralized areas that include bauxite, columbium (niobium) and tantalum, diamond, diatomite, granite, graphite, iron, kaolin, marble, silica sand, talc, tin, and tungsten. Chromium, copper, gypsum, lead, manganese, nickel, platinum, titanium, uranium, and zinc occurrences also were noted (Ministère des Mines, de l'Énergie et du Pétrole, 1995, p. 24-38).

Trade

Crude oil was exported via the Chad-Cameroon pipeline and its export terminal at Kribi, Cameroon. Most other formal international trade with landlocked Chad was funneled through seaports in Cameroon and Nigeria. In 2004, the value of exports from Chad was estimated to be $2.1 billion compared with a revised $451 million in 2003, of which crude oil exports were valued at about $1.9 billion in 2004 compared with $224 million in 2003. In 2004, imports into Chad were estimated to be $922.7 million compared with a revised $846.8 million in 2003. The completion of the Chad-Cameroon pipeline and the development of the initial three oilfields in the Doba Basin accounted for the decline in the value of imports for the oil sector to $428.9 million in 2004 from $472.7 million in 2003. Oilfield imports were not expected to become negligible in the short term because Esso Exploration and Production Chad Inc. (Esso Chad) was authorized to begin construction of the 25-well Moundouli and the 4-well Nya Fields in 2005 (International Monetary Fund, 2005, p. 29; Esso Exploration and Production Chad Inc., 2005§).

Structure of the Mineral Industry

In Chad, the Ministère du Plan, du Développement, et de la Coopération, the Ministère des Mines et de l'Énergie, and the Ministère du Pétrole were responsible for developing policy that affected various sectors of the mineral industry. The Direction des Recherches Géologiques et Minières organized mineral sector investigations, and the Direction du Pétrole was responsible for the administration of the petroleum sector. The Petroleum Code was under revision by the Government.

Most minerals in Chad, such as clay, gold, natron (soda ash), salt, sand and gravel, and stone, were produced by small-scale local miners. Independent and major international oil companies were involved in the exploration for and production of crude oil. Esso Chad and Tchad Oil Transportation Co. S.A. operated about 200 kilometers (km) of the 1,070-km Chad-Cameroon crude oil pipeline that was in Chad.

Commodity Review

Metals

Gold.—In 2002, Global Resources Corp. (a subsidiary of Afko Corea Ltd. of South Korea) had suspended active operations on a small placer gold deposit at Gamboké to complete a feasibility study. Prospecting had continued at Goïn, Goïgoudoum, and Massonébaré. Besides local artisanal gold operations, activity in the sector was minimal in 2004.

[1]References that include a section mark (§) are found in the Internet References Cited section.

[2]Where necessary, values have been converted from Communauté Financière Africaine francs (XAF) to U.S. dollars (US$) at the average rate of XAF534.4=US$1.00 for 2004 and XAF580.1=US$1.00 for 2003. Purchasing power parity valuation was based on the average rate of XAF188.1=US$1.00 for 2004.

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Mineral Fuels

Petroleum.—Esso Chad, which was a venture of Exxon Mobil Corp. of the United States (40% equity interest), Petronas Carigali Overseas Sdn. Bhd. of Malaysia (35%), and Chevron Overseas Petroleum Inc. of the United States (25%), started production from the Komé Field in the first quarter of 2004 and from the Bolobo Field in the third quarter. In 2005, in addition to exploration of the Moundouli and the Nya Fields, Esso Chad was expected to continue exploration of the Belanga, the Mangara, and the M'Bikou prospects.

Various factions within Chad expressed displeasure with the price received for the exported crude. Crude oil from the Bolobo, the Komé, and the Miandoum Fields was blended at Esso Chad's central treating facility at Komé. ChevronTexaco released an assay of the Doba Blend crude in early 2004 prior to the addition of the Bolobo feed. At that time, the Doba Blend crude had a value of 20.5° American Petroleum Institute (API) gravity, a sulfur (S) content of 0.16%, and a total acid number of 4.1 milligrams (mg) potassium hydroxide per gram (KOH/g) oil compared with Brent Blend benchmark crude oil, which has a 38.5° API gravity, 0.43% S, and a total acid number of 0.03 mg KOH/g; Brent Blend is classified as light (30° API or higher) and sweet (less than 1.5% sulfur by weight). Various Nigerian crudes that would have similar seaborne transportation costs as oil from Chad included Brass River, 43.5° API, 0.07% S; Qua Ibo, 35.6° API, 0.1% S; Bonny Light 34.5° API, 0.1% S, and 0.27 mg KOH/g; and Escravos, 34.2° API, 0.15% S, and 0.53 mg KOH/g. The published ChevronTexaco assay would place the Doba Blend crude oil in the heavy, sweet, high-acid crude category, which had marketing problems despite the well-publicized increase in crude oil prices in 2004. In general, most crude oil refineries in China and Europe were designed to process light crude oil. Compared with the price of a light crude, such as Brent, heavy crude oil sold at a discount, which ranged from about $8 at the beginning of 2004 to more than $16 at yearend. Additional costs that reduced the income from the exported Doba Blend included the cost of transportation of the crude oil from Chad to the export terminal in Cameroon. Debt repayment, recovery of investment in the pipeline by the partners, operation and maintenance fees, and transit fees were included in the transportation cost and totaled about $10 per barrel (Platt's, 1999§; Africa Energy Intelligence, 2004; Oil & Gas Journal, 2004; Agence France Press, 2004§; Esso Exploration and Production Chad Inc., 2005§; Saunders, 2005§).

Other points of contention included the delay (until the project has ended) in payment for produced oil that had been used to fill the pipeline and Esso Chad's use of production data measured at the Kribi export terminal in Cameroon instead of at the Komé pumping station in Chad. Crude oil volume, which was metered at Komé, reportedly was 1.4% higher than that measured at Kribi; this was a difference of about 700,000 barrels for the period that ranged from the start of pumping in 2003 until yearend 2004 (Presidential Press Service, 2004; Gary and Reisch, 2005, p. 26, 48-50).

In 2004, EnCana Corp. of Canada, which had acquired a 50% interest in the Permit H concession from Cliveden Petroleum Co. Ltd. of the British Virgin Islands in 2002, drilled four exploration wells and acquired additional seismic data on the Permit H concession. Also in 2004, Citic Resources Holdings (a subsidiary of China International Trust & Investment Corp.) obtained 25% interest in the Permit H concession from Cliveden. As part of its continued bankruptcy proceedings, Trinity Energy Resources, Inc. of the United States resolved some of its legal differences with Cliveden. Trinity, which had farmed out much of its interest in its Permit H concession to Cliveden in 1999, would increase its interest in the concession to 10%.

In December, Energem Petroleum (Chad) Ltd. (a subsidiary of Energem Resources Inc. of Canada) was awarded the Chari West and the Largeau oil and gas concessions. The 8,200-km^2 Chari West concession was in the Doba Basin, and the more than 251,000-km^2 Largeau concession was in central and northern Chad (Energem Resources Inc., 2004).

There was little physical progress on the redevelopment of the Sedigui oilfield and construction of a small oil refinery at Farcha, although in 2004, the Industrial Development Corporation of South Africa Ltd. had been approached to finance the refinery.

Infrastructure

Surface transportation in Chad was difficult. Of the nation's 40,000-km network of roadways and trails, only about 650 km was paved; the rest were passable in the dry season. The Government proposed to pave more roads in southern agricultural areas. Electricity was available in the capital of N'Djamena but was subject to frequent outages. Other areas in the country relied primarily on small diesel-fueled generators or solar cells. Fuel for the generators was imported from Cameroon and Nigeria. The telecommunications infrastructure was limited.

Outlook

To some extent, the World Bank's future participation in the advancement of the extractive industries of developing countries depends on the positive transformation of Chad's economy by the Chad-Cameroon export pipeline project. The pipeline, however, was completed nearly a year ahead of schedule, and the development of the initial three Doba Basin oilfields was accomplished 5 months ahead of schedule, which resulted in the Government's Oil Revenue Management System not keeping up with the actual progress of the oilfield facilities and problems with some international financial institutions' programs to build Chad's institutional capacity. Domestic and foreign monitoring organizations noted several physical or social problems associated with the oilfield development and potential flaws in the Government's Oil Revenue Management System.

The expected income from the initial production from the Doba Basin oilfields has been enhanced by higher-than-projected prices for crude oil in 2004. As a result of the successful oilfield development and the general trend of rising international mineral commodity prices in 2004, the Ministère des Mines et de l'Énergie has proposed to resume vigorous

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promotion of the development of other mineral commodities and unleased petroleum prospects in Chad; although as oil development languished for years until the pipeline was built, the lack of transport may limit the development options for other minerals. High-value low-weight commodities, such as diamond and gold, would be more readily developed than base metals. Import substitution, such as the development of a cement plant, could enhance the feasibility of some processed mineral commodity projects. The proposed Farcha oil refinery could reduce some of the country's dependence on imported asphalt and refined petroleum products and provide fuel for electricity generation in N'Djamena.

The crude oil export pipeline was designed with some excess capacity for additional oilfield development. Originally, potential production from the Permit H concession was projected to be used to top off the pipeline, but the excess capacity also could be filled with early production from the Moundouli and the Nya projects, and base capacity, used for a longer-than-expected period with the output from the Bolobo, the Komé, and the Miandoum Fields. Current (2004) capacity constraints could be circumvented with the addition of supplemental pumping stations that would increase the pipeline's throughput if the EnCana or the Energem concessions are successfully developed.

Potential mineral industry development could be negatively impacted by the social instability in eastern Chad that was associated with the military action in the Darfur region of Sudan and exploration activity in Chad could be adversely affected by the continued unrest in the north and leftover antipersonnel and antitank land mines in the Borkou-Ennedi-Tibesti, the Guera, the Moyen Chari, and the Salamat regions.

References Cited

Africa Energy Intelligence, 2004, Why the fight with Exxon?: Africa Energy Intelligence, no. 379, October 20, p. 7.

Energem Resources Inc., 2004, Chad up-stream oil concession awarded to Energem: Vancouver, British Columbia, Canada, Energem Resources Inc. press release, December 9, 3 p.

Gary, Ian, and Reisch, Nikki, 2005, Chad's oil—Miracle or mirage?: Washington, DC, Catholic Relief Services and Bank Information Center, 117 p.

Georgiou, Andreas, Strauss, Tove, Lacoche, Sarah, and Allain, Laurence, 2004, Chad—Statistical annex: Washington, DC, International Monetary Fund Country Report No. 04/115, April, 46 p.

International Finance Corp., 2004, Fact sheet on revenue management and transparency: Washington, DC, International Finance Corp., 2 p.

International Monetary Fund, 2005, Chad—Requests for a three-year arrangement under the poverty reduction and growth facility and additional interim assistance under the enhanced HIPC initiative—Staff report; press release on the executive board discussion; and statement by the executive director for Chad: Washington, DC, International Monetary Fund Country Report No. 05/74, March, 79 p.

Ministère des Mines, de l'Énergie et du Pétrole, 1995, Chad—A guide for the mining investor: N'Djamena, Chad, Ministère de Mines, de l'Énergie et du Pétrole, June, 57 p.

Oil & Gas Journal, 2004, ChevronTexaco assays Doba crude: Oil & Gas Journal, v. 102, no. 13, April 5, p 54-57.

Presidential Press Service, 2004, Chadian oil—Swindling, murkiness and fraud by the consortium in the exploitation of Doba crude: N'Djamena, Chad, Presidential Press Service press release, October 7, 3 p.

Sachs, J.D., and Warner, A.M., Natural resource abundance and economic growth: Cambridge, MA, National Bureau of Economic Research, Inc. Working Paper 5398, December, 47 p.

World Bank Group, 2004, Chad at a glance: Washington, DC, World Bank Group, October 15, 2 p.

Internet References Cited

Agence France Press, 2004 (September 29), Oil shortage or surplus? It depends on type of crude, accessed May 16, 2005, at URL http://www.energybulletin.net/2341.html.

Esso Exploration and Production Chad Inc., 2005, Chad/Cameroon development project report No. 17, 4th quarter 2004 and annual summary 2004, accessed May 2, 2005, at URL http://www.essochad.com/Chad/Files/Chad/17_allchapters.pdf.

International Monetary Fund, 2005 (April), Chad, World Economic Outlook Database, accessed May 3, 2005, at URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

Pegg, Scott, Assistant Professor, Indiana University-Purdue University Indianapolis, 2005, Can policy intervention beat the resource curse?, Evidence from the Chad-Cameroon Pipeline Project, accessed May 18, 2005, via URL https://www.slashtmp.iu.edu/public/download.php?FILE=smpegg/6965SCqn9j.

Platt's, 1999, Platt's oil guide to specifications, accessed May 13, 2005, at URL http://www.emis.platts.com/thezone/guides/plats/oil/crudeoilspecs.html.

Saunders, Jay, Energy Analyst, Deutsche Bank, 2005 (April 12), Drowning in sour oil, accessed May 16, 2005, at URL http://www.eia.doe.gov/oiaf/aeo/conf/pdf/saunders.pdf.

Spera, Vincent, Consular/Economic Officer, U.S. Department of State, 2004 (August 2), Chad, Country Commercial Guide, accessed May 10, 2005, at URL http://www.buyusainfo.net/info.cfm?id=126314&keyx=B80E803D5A499A4B6B6BFF1027CA9605&dbf=ccg1&loadnav=no&archived=no&addid.

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TABLE 1
CHAD: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
Aggregate, sand, and stone		300	500	500	300	300
Gold, mine output, Au content	kilograms	120	150	150	150	150
Natron (soda ash)		12	12	12	12	12
Petroleum, crude	thousand 42-gallon barrels	--	--	--	8,600 [4]	61,400 [4]
Salt		9	9	9	9	9

[r]Revised. -- Zero.

[1]Includes data available through May 13, 2005.

[2]Estimated data are rounded to no more than three significant digits.

[3]In addition to the commodities listed, other industrial minerals and construction materials (clay, lime, and limestone) are produced, but information is inadequate to make reliable estimates of output.

[4]Reported figure. Production volume was metered on the floating, storage, and offloading vessel offshore Kribi, Cameroon.

TABLE 2
CHAD: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies and and major equity owners	Location of main facilities	Annual capacity
Clay		Various local operators	Various locations	NA
Gold	kilograms	Artisanal placer operations	Mayo Dala Department	150
Lime		Various local operators	Various locations	NA
Limestone		Société d'Exploitation Minière de Pala	Louga quarry	NA
Petroleum, crude	42-gallon barrels per day	Esso Exploration and Production Chad Inc. (Exxon Mobil Corp., 40%; Petronas Carigali Overseas Sdh. Bhd., 35%; Chevron Overseas Petroleum Inc., 25%)	Bolobo, Kome, and Miandoum Fields, Doba Basin	217,000 [1]
Salt		Various local operators	Various locations	9,000
Sand and gravel		do.	Chari and Logone Rivers	300,000
Soda ash		do.	Lake Chad, near Liwa	12,000
Stone, crushed		Société Tchadienne d'Exploitation des Carrières	Mani quarry, Dandi	NA

NA Not available.

[1]Expected to reach 225,000 barrels per day by 2005.

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The Mineral Industries of Comoros, Mauritius, Reunion, and Seychelles

By Thomas R. Yager

COMOROS

The Federal Islamic Republic of the Comoros is located on three main islands in the Mozambique Channel about two-thirds of the way between northern Madagascar and northern Mozambique. In 2004, the mineral industry of Comoros continued to be limited to the production of such construction materials as clay, sand and gravel, and crushed stone for local consumption. The demand for cement, petroleum products, and steel was met through imports.

In 2004, the gross domestic product (GDP) of Comoros amounted to about $1 billion based on purchasing power parity. The GDP increased by 1.9% in 2004 after rising by 2.1% in 2003. In 2002, construction and public works accounted for about 6% of the GDP; manufacturing, 4%; and electricity, gas, and water, 2% (International Monetary Fund, 2004, p. 73; 2005, p. 208; 2005§[1]).

In 2002 (the latest year for which data were available), imports of iron and steel were 4,795 metric tons (t) compared with 2,481 t in 2001 and 3,168 t in 1997. The value of iron and steel imports amounted to about $2.2 million in 2002, or nearly 4% of total imports (International Monetary Fund, 2004, p. 104).

Imports of cement were 29,985 t in 2002 compared with 40,000 t in 2001 and 24,088 t in 1997. The value of cement imports amounted to about $2.1 million in 2002, or 3% of total imports (International Monetary Fund, 2004, p. 104).

In 2002, Comoros operated powerplants that had a total capacity of 13 megawatts (MW). The production of electricity was 33.5 gigawatthours (GWh) in 2002 compared with 32 GWh in 2001 and 29 GWh in 1998. From 1998 to 2002, reported national consumption of electricity rose to 31 GWh from 18 GWh. Fossil fuels provided most of the country's power; geothermal energy resources were known to occur within the territory, but were not developed. Imports of petroleum products were 48,480 t in 2002 compared with 45,103 t in 2001 and 16,380 t in 1997. The value of imported petroleum products amounted to $11.4 million in 2002, or 18% of total imports (International Monetary Fund, 2004, p. 83, 104).

Outlook

Minerals output was not expected to change significantly because Comoros has very limited mineral resources and weak infrastructure. Adversarial relationships among island Governments have nearly halted economic reforms (United Nations Integrated Regional Information Networks, 2004). Import dependence and deforestation may lead to development of the country's geothermal resources. The International Monetary Fund (2005, p. 208) predicted that the GDP would increase by 3% in 2005 and 3.5% in 2006.

[1]References that include a section mark (§) are found in the Internet Reference(s) Cited sections.

References Cited

International Monetary Fund, 2004, Union of the Comoros—Selected issues and statistical appendix: Washington, DC, International Monetary Fund, August 13, 108 p.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

United Nations Integrated Regional Information Networks, 2004, Comoros—Political tensions disrupt economic reforms—Report: New York, New York, United Nations Integrated Regional Information Networks press release, August 18, 2 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Comoros, World Economic Outlook Database, accessed April 22, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

MAURITIUS

The Republic of Mauritius is located about 1,000 kilometers (km) east of Madagascar. In 2004, Mauritius produced basalt construction stone, lime from coral, sand, semimanufactured steel, and solar-evaporated sea salt. Local companies also cut imported diamond.

In 2004, the GDP of Mauritius amounted to about $14.9 billion based on purchasing power parity; per capita GDP was about $12,200. The GDP increased by 4.4% in 2004 after rising by 3% in 2003. Manufacturing accounted for 18% of the GDP; construction, 5%; electricity, gas, and water, 2%; and mining and quarrying, less than 1% (International Monetary Fund, 2005, p. 208; 2005§; Mauritius Central Statistics Office, 2005b, p. 31).

Domestic rolling mills produced steel-reinforcing bars (rebar) and welded mesh using imported ingot as raw material. In 2004, the production of iron bars and steel tubes rose to 65,000 t from 58,700 t in 2003. Imports of iron and steel amounted to 109,000 t at a value of $67.5 million in 2004, or about 2% of total imports (Mauritius Central Statistics Office, 2005a, p. 22, 25; 2005b, p. 27).

United Basalt Products (UBP) was the leading producer of building materials in Mauritius. UBP produced aggregates at 10 locations on the island of Mauritius. On the island of Rodrigues, Welcome Industries Ltd. (a subsidiary of UBP) had a production capacity of nearly 150,000 metric tons per year (t/yr) of aggregates. Gamma Civic Ltd. also produced aggregates.

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Mauritius did not produce cement in 2004; all the country's cement requirements were imported. In 2004, imports of cement amounted to 719,000 t at a value of $39.6 million, or about 1% of total imports (Mauritius Central Statistics Office, 2005a, p. 22, 25).

Mauritius Chemical and Fertilizer Industry Ltd. was the country's only producer of fertilizers. In 2004, fertilizer production rose to 89,400 t from 82,000 t in 2003. Imports of fertilizers amounted to 48,000 t at a value of $11.1 million in 2004 (Mauritius Central Statistics Office, 2005a, p. 25; 2005b, p. 27).

Mauritius had no identified resources of fossil fuels. In 2004, imports of coal were 331,800 t compared with 289,400 t in 2003. Gamma Civic operated an asphalt plant; the demand for all other petroleum products was met through imports. The value of imported mineral fuels, lubricants, and related products amounted to $359 million in 2004, or nearly 13% of total imports (Mauritius Central Statistics Office, 2005a, p. 22-23; 2005b, p. 28).

National production of electricity rose to 2,117 GWh in 2004 from 2,058 GWh in 2003. In 2003, diesel and fuel oil accounted for 48.8% of electricity generated; coal, 22.7%; bagasse, 21.3%, hydroelectric plants, 5.7%; and kerosene, 1.5%. Mauritius had powerplants with an effective generating capacity of 568.3 megawatts (MW). The state-owned Central Electricity Board planned to expand capacity at the 48-MW Port Louis power station to between 78 and 87 MW and to build a new bagasse-powered facility with a capacity of 60 MW (Africa Energy Intelligence, 2004; Mauritius Central Statistics Office, 2004, p. 12; 2005b, p. 28).

Outlook

The economy of Mauritius is likely to continue to grow steadily in the near future. The International Monetary Fund (2005, p. 208) predicted that the GDP would increase by 3.7% in 2005 and by 2.9% in 2006. In the short run, the growth in the minerals sector is likely to be restricted to construction materials. Offshore oil exploration has been inconclusive, and polymetallic nodules on the ocean floor are unlikely to be developed in the foreseeable future.

References Cited

Africa Energy Intelligence, 2004, Mauritius—Four line up for renovation: Africa Energy Intelligence, no. 370, May 26-June 8, p. 7.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Mauritius Central Statistics Office, 2004, Energy and water statistics—2003: Port Louis, Mauritius, Mauritius Central Statistics Office, 19 p.

Mauritius Central Statistics Office, 2005a, External trade—4th quarter 2004: Port Louis, Mauritius, Mauritius Central Statistics Office, 31 p.

Mauritius Central Statistics Office, 2005b, Mauritius in figures: Port Louis, Mauritius, Mauritius Central Statistics Office, 42 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Mauritius, World Economic Outlook Database, accessed April 22, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

REUNION

Reunion, which is an overseas department of France, is located about 650 km east of Madagascar. Production of mineral commodities represented only a small part of the economy of Reunion, although little quantitative information was available. In 2000, construction and public works accounted for 7% of the GDP; manufacturing, 4%; and energy, 1% (Gautier, 2004).

Holcim (Réunion) S.A. produced 380,000 t/yr of hydraulic cement by grinding imported clinker; its plant at Le Port had a capacity of 400,000 t/yr. The company also produced 1.3 million metric tons per year of aggregates from plants at Bras Panon, Sainte-Clotilde, Saint-Joseph, and Saint-Pierre [Holcim (Réunion) S.A., 2003]. Additionally, seacoast coral continued to meet local construction needs.

Reunion has no identified resources of coal or petroleum; all petroleum demand was met through imports. In 2004, the Government decided to build a 70-km railway to link St. Benoit, St. Denis, and St. Paul because of increasing road congestion. The railway was expected to be completed in 2012 at a cost of $1.6 billion to $1.7 billion (International Railway Journal, 2004§).

References Cited

Gautier, Alexandre, 2004, Légère inflexion de la croissance en l'an 2000: Économie de la Réunion, no. 121, Second quarter, p. 2-4.

Holcim (Réunion) S.A., 2003, Holcim intègre l'environment et la sécurité à son programme de développement (Holcim integrates environment and safety into its program of development): Le Port, Reunion, Holcim (Réunion) S.A. press release, November 23, 1 p.

Internet Reference Cited

International Railway Journal, 2004 (March 26), Réunion to have a railway, accessed May 5, 2005, at URL http://www.railjournal.com/latenews_archive.html.

SEYCHELLES

The Republic of Seychelles is a group of 40 granitic and 50 or more coralline islands that is located northeast of Madagascar in the Indian Ocean. Mineral production in Seychelles consisted mostly of production of such construction materials as clay, coral, sand, and stone.

In 2004, the GDP of Seychelles amounted to about $980 million based on purchasing power parity. The GDP fell by 2% in 2004 after declining by 6.3% in 2003. Handicrafts, manufacturing, and mining accounted for 17% of the GDP; building and construction, 10%; and electricity and water, 2%. In 2004, the building and construction sector grew by 34%, and the electricity and water sector, 1.3% (Central Bank of Seychelles, 2004, p. 56-57; International Monetary Fund, 2005, p. 208; 2005§).

Seychelles had no identified resources of fossil fuels. In 2004, imports of mineral fuels amounted to nearly $98 million, which was 22% of total imports. The production of electricity for 2003 was 242 GWh compared with 229 GWh in 2002 and

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159 GWh in 1998 (Central Bank of Seychelles, 2004, p. 76; 2005, p. 45).

Outlook

The International Monetary Fund (2005, p. 208) predicted that the GDP of Seychelles would decline by 4% in 2005 and rise by 3% in 2006. The short-term outlook for mineral production is for little change. Seychelles has modest natural resources, and any newly discovered resources of petroleum and natural gas could not be exploited immediately.

References Cited

Central Bank of Seychelles, 2004, Quarterly review: Victoria, Seychelles, Central Bank of Seychelles, v. 22, no. 1, January-March, 77 p.

Central Bank of Seychelles, 2005, Annual report 2004: Victoria, Seychelles, Central Bank of Seychelles, 94 p.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Seychelles, World Economic Outlook Database, accessed April 22, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

TABLE 1
MAURITIUS, REUNION, AND SEYCHELLES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity	2000	2001	2002	2003	2004[e]
MAURITIUS[2]					
Fertilizers	83,673	84,278	86,100	82,000 [r]	89,400 [3]
Salt, marine	6,100	6,800	7,000	7,200 [e]	7,700
Sand, coral[e]	400,000 [3]	410,000	--	--	--
Steel, semimanufactures	46,000	48,700	52,400	58,700	65,000 [3]
REUNION[4]					
Cement[e]	380,000	380,000	380,000	380,000	380,000
SEYCHELLES					
Dimension stone, granite	54,788	6,044	97,576 [r]	92,120 [r]	93,000
Gravel and crushed rock	230,000 [r, e]	245,000 [r, e]	239,746	212,926	213,000
Sand	12,053	8,128	2,840	2,165	2,200

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.
[1]Includes data available through July 5, 2005.
[2]In addition to the commodities listed, asphalt, basalt, and lime are also known to be produced, but information is inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]In addition to the commodity listed, coral and volcanic rock are also known to be produced, but information is inadequate to make reliable estimates of output levels.

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The Mineral Industry of Congo (Brazzaville)

By Philip M. Mobbs

The economy of the Republic of the Congo [Congo (Brazzaville)] was based largely on the production of crude oil. Located in equatorial central Africa and bounded by the Cabinda enclave of Angola and the Democratic Republic of the Congo [Congo (Kinshasa)] to the south and east and by Cameroon, the Central African Republic, and Gabon to the west and north, Congo (Brazzaville) has an area of 342,000 square kilometers that supported a population of about 3 million. In 2004, the country had a gross domestic product (GDP) at current prices of $4.6 billion,[1] a GDP based on purchasing power parity of $4.1 billion, and a GDP per capita based on purchasing power parity of $1,267. Real GDP increased by 4% in 2004 compared with a growth rate of 0.8% in 2003. In 2004, oil accounted for about 90% of export earnings, 66% of the Government's fiscal revenues budget, and more than 50% of the country's GDP. The value of oil exports was estimated to be $2.7 billion in 2004 and $2.1 billion in 2003 (International Monetary Fund, 2005, p. 19; 2004§,[2] 2005§).

Government Programs

The Kimberley Process is an international system that regulated trade in rough diamond. The program resulted from international concern about illegally mined diamond in global diamond trade and diamond revenues being used to support civil conflicts in Angola, Sierra Leone, and elsewhere. The Kimberley Process Certification Scheme, which officially was inaugurated in January 2003, requires that rough diamond shipped from participant countries, regional economic unions, and rough-diamond trading concerns be exported in tamper-resistant containers and that shippers provide certificates of origin.

At the beginning of the year, Congo (Brazzaville) participated in the Kimberley Process and was working with the International Monetary Fund to improve the quality of the national statistics. In June, the Government began the procedure to join the Extractive Industries Transparency Initiative.

Commodity Review

Metals

Gold.—Production from the Yangadou Mine of Société d'Exploitation Minière S.A. of Italy tailed off dramatically to about 4 kilograms per month because of technical problems. The mine in the Sangha Department, which opened in 2003, originally had been projected to produce about 1,500 kilograms per year of gold (Officiel d'Information et de Conseil sur le Congo, 2004§).

Magnesium.—In 2004, bankable feasibility studies of the development of the magnesium salt deposits in the Kouilou region and a magnesium smelter were underway for Magnesium Alloy Corp. (MagAlloy) of Canada. MagAlloy Congo S.A., which was a partnership of MagAlloy (90%) and the Government (10%), was to manage the solution mining operation. In December 2004, MagAlloy proposed changing its name to MagIndustries Corp. and creating the 100% subsidiary MagMetals Inc., which would develop a 72,000-metric-ton-per-year (t/yr)-capacity smelter at Point Noire with initial production at the rate of 60,000 t/yr (Magnesium Alloy Corp., 2004, p. 1; MagIndustries Corp., 2005, p. 1; 2005§).

Industrial Minerals

Cement.—Rehabilitation of the cement plant of Société Nouvelle des Ciments du Congo (SONOCC) continued in 2004. The plant at Loutété, which had been operated by Cimenterie du Congo, had been severely damaged during the 1997 civil war. SONOCC's Chinese majority interest owner managed the reconstruction of the 250,000-t/yr-capacity plant (Elion, 2004a§).

Diamond.—As a participant in the Kimberley Process, Congo (Brazzaville) hosted a Kimberley Process fact-finding mission in 2004, which reportedly indicated that diamond exports, which ranged from 3 million to 5 million carats per year, significantly exceeded domestic production. This finding resulted in the removal of Congo (Brazzaville) from the list of Kimberley Process participants in July and effectively suspended legal exports of diamond from Congo (Brazzaville). The Government responded that its national statistics program did not track diamond production and that the Government did not get involved until the diamond was exported. Additionally, because of Congo (Brazzaville)'s uncontrolled borders, the Government stated that it was unable to control smuggling, especially of diamond from other countries [particularly Congo (Kinshasa)] (Kimberley Process, 2004; Elion, 2004b§).

Potash and Salt.—In December 2004, MagAlloy proposed the creation of the 100% subsidiary MagMinerals Inc., which would develop the potash and salt resources of the Kouilou deposit. Initial plans called for a 300,000-t/yr-capacity potash fertilizer plant and a 400,000-t/yr-capacity salt plant at Point Noire (MagIndustries Corp., 2005, p. 1).

Mineral Fuels

Natural Gas and Petroleum.—Several subsidiaries of the state-owned Société Nationale des Pétroles du Congo (SNPC) managed the Government's interest in petroleum and natural gas. Société Nationale de Recherche et d'Exploration Pétrolière

[1]Where necessary, values have been converted from Communauté Financière Africaine francs (XAF) to U.S. dollars (US$) at the average rate of XAF549.16=US$1.00 for 2004 and XAF590.97=US$1.00 for 2003.

[2]References that include a section mark (§) are found in the Internet References Cited section.

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was the SNPC's exploration and production company. In 2002, the SNPC ended operations at the Congolaise de Raffinage (CORAF) refinery at Pointe Noire and proposed privatizing the operation. The SNPC also divested 75% interest in its refined hydrocarbon distribution, storage terminal, and transport function to the Société Commune de Logistique (SCLOG). Other partners in the SCLOG included ChevronTexaco Global Energy Inc., Total Congo S.A., and a consortium that comprised Puma International Congo and X-Oil Congo S.A.

Some produced natural gas was stripped of liquids on the Nkossa offshore barge, some was reinjected to maintain reservoir pressure, but most gas produced in Congo (Brazzaville) was flared. The Government estimated that about 3 million cubic meters per day was flared and began to consider economic options for the gas (Kiwano Ltd., 2003§).

Total Exploration & Production Congo (Total E&P Congo) (a subsidiary of Total S.A. of France) was the major private operator in the petroleum sector of Congo (Brazzaville). Total operated eight oilfields for various partners through production-sharing agreements with the SNPC. Agip Congo S.A. (a subsidiary of Eni S.p.A. of Italy) operated five oilfields; Maurel & Prom of France, three; and the Perenco Group of France and the United Kingdom, two.

Outlook

Congo (Brazzaville)'s recovery from the 1997 civil war has included the adoption of a new constitution, restoration of the Government, restructuring of state-owned companies, and resettling refugees who were displaced during the war. Despite Congo (Brazzaville)'s recent oil production decline, the petroleum sector will remain the cornerstone of the economy for the immediate future. The decline in national production was attributed to the maturing of existing fields, but production is expected to rebound with the development of the Bilondo, the Libondi, the Litanzi, the Moho Nord, the Moho Sud, the Nkoso Sud, the N'Soko, and the Yanga Sud oilfields and the offshore K/A-IMI unit [which included the former block 14 in Angola and the former Haute Mer concession in Congo (Brazzaville)]. Exploration wells on the deepwater Mer Très Profonde Sud permit, especially Total E&P Congo's Pégase Nord Marin 1, are expected to encourage additional evaluation of deepwater prospects.

The proposed Kouilou magnesium project could significantly stimulate the postwar economy and aid development of the country's power infrastructure. At the end of 2004, however, the project was still awaiting completion of a favorable bankable feasibility study.

References Cited

International Monetary Fund, 2005, Republic of Congo—Interim poverty reduction strategy paper progress report: Washington D.C., International Monetary Fund Country report 05/39, February, 72 p.

Kimberley Process, 2004, Kimberley Process removes the Republic of Congo from the List of Participants: Ottawa, Ontario, Canada, Kimberley Process news release, July 9, 5 p.

Magnesium Alloy Corp., 2004, Second quarter report September 30th, 2004: Wallace, Nova Scotia, Canada, Magnesium Alloy Corp., 10 p.

MagIndustries Corp., 2005, Third quarter report December 31st, 2004: Wallace, Nova Scotia, Canada, MagIndustries Corp., 11 p.

Internet References Cited

Elion, Brice, 2004a (February 11), La cimenterie de Loutété opérationnelle en Octobre 2004, accessed June 29, 2005, at URL http://www.congo-site.info/index.php?action=article&id_article=50173.

Elion, Brice, 2004b (June 7), Le Congo s'engage à encadre les tenants des bureaux de diamants, accessed June 29, 2005, at URL http://www.congo-site.info/index.php?action=article&id_article=51883.

International Monetary Fund, 2004 (October), Republic of Congo—Balance of payments—2000-07, accessed June 29, 2005, via URL http://www.mefbcg.org/stat_donnees_economiques/pdf/MacroTables_PRGF-Oct-2004I-Balance des paiements.pdf.

International Monetary Fund, 2005 (April), Congo, Republic of, World Economic Outlook Database, accessed June 25, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

Kiwano Ltd., 2003 (May), Interview exclusive avec son Excellence Jean-Baptiste Tati Loutard—Ministre des Hydrocarbures, accessed July 8, 2005, at URL http://congo.kiwano.net/opinion/04.htm.

MagIndustries Corp., 2005, MagMetals Inc.—Overview, accessed July 5, 2005, at http://www.magindustries.com/detail.php?id=508.

Officiel d'Information et de Conseil sur le Congo, 2004 (December 24), Mines—Baisse de production de la SEMI, accessed June 29, 2005, at URL http://www.congo-site.com/pub/fr/v4x/actualities/article.php?num=2572.

Major Source of Information

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TABLE 1

CONGO (BRAZZAVILLE): PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2000	2001	2002[e]	2003[e]	2004[e]
Cement, hydraulic	thousand metric tons	20	--	--	--	--
Diamond[e]	carats	50,000	50,000	25,000	30,000	50,000
Gold, mine output, Au content[e]	kilograms	10	10	10	75 r	60
Lime[e]	metric tons	390	390	390	390	400
Liquid petroleum gas, propane	thousand 42-gallon barrels	3,910	3,734	3,000 r	1,900 r	919
Petroleum:						
Crude	do.	100,375	98,920	94,170 [3]	81,646 r, [3]	82,069 [3]
Refined	do.	2,573	2,752	2,800	--	--

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.

[1]Includes data available through June 2005.

[2]Natural gas is also extracted, but all is vented or flared.

[3]Reported figure.

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TABLE 2
CONGO (BRAZZAVILLE): STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand 42-gallon barrels unless otherwise specified)

Commodity	Major operating companies and and major equity owners	Location of main facilities	Estimated annual capacity
Cement metric tons	Société Nouvelle des Ciments du Congo (Société National Chinoise des travaux des ponts et chaussées, 56%, and Government, 44%)	Loutete	250,000 [1]
Diamond carats	Artisanal production	Likouala Dept.	50,000
Gold kilograms	Société d'Exploitation Minière S.A.	Yangadou	1,500
Liquefied petroleum gas	Total Exploration & Production Congo, 51%; Chevron Overseas (Congo) Ltd., 20%; Société Nationale des Pétroles du Congo, 15%; Energy Africa (subsidiary of Tullow Oil plc), 4%	Nkossa Field	92
Petroleum, crude	Total Exploration & Production Congo, 51%; Chevron Overseas (Congo) Ltd., 20%; Société Nationale des Pétroles du Congo, 15%; Energy Africa (subsidiary of Tullow Oil plc), 4%	Nkossa Field	25,000
Do.	Agip Congo S.A., 35.75%; Société Nationale des Pétroles du Congo, 35%; Chevron Overseas (Congo) Ltd., 29.25%	Kitina Field	15,000
Do.	Total Exploration & Production Congo, 65%, and Agip Congo S.A., 35%	Tchibouela Field	15,000
Do.	Agip Congo S.A., 65%, and Total Exploration & Production Congo S.A., 35%	Zatchi Field	12,000
Do.	Zetah Maurel & Prom Congo S.A.R.L. [Maurel & Prom, 54%; Tacoma Resources Ltd. (subsidiary of Burren Energy PLC), 35%; Energy Africa (subsidiary of Tullow Oil plc), 11%]	M'Boundi Field	7,300
Do.	CMS NOMECO Congo (Société Nationale des Pétroles du Congo, 50%; Perenco Group, 25%; Nuevo Congo Co.[2], 18.75%; Kuwait Foreign Petroleum Exploration Co. (K.S.C.), 6.25%)	Youmbo Field	6,100
Do.	Total Exploration & Production Congo, 55.25%; Agip Congo S.A., 29.75%; Société Nationale des Pétroles du Congo, 15%	Sendji Field	6,000
Do.	Total Exploration & Production Congo, 65%, and Agip Congo S.A., 35%	Likalala Field	3,900
Do.	Total Exploration & Production Congo, 65%, and Agip Congo S.A., 35%	Kombi Field	3,800
Do.	Likouala S.A., 65%, and Agip Congo S.A., 35%	Likouala Field	3,800
Do.	Total Exploration & Production Congo, 65%, and Agip Congo S.A., 35%	Tchibeli Field	3,700
Do.	Total Exploration & Production Congo, 55.25%; Agip Congo S.A., 29.75%; Société Nationale des Pétroles du Congo, 15%	Yanga Field	3,500
Do.	Congorep (subsidiary of Perenco Group), 51%, and Société Nationale des Pétroles du Congo, 49%	Emeraude Field	3,300
Do.	Agip Congo S.A., 52%; Société Nationale des Pétroles du Congo, 35%; Sasol Ltd., 13%	Foukanda Field	3,000
Do.	Total Exploration & Production Congo, 65%, and Agip Congo S.A., 35%	Tchendo Field	3,000
Do.	Agip Congo S.A., 65%, and Société Nationale des Pétroles du Congo, 35%	Mwafi Field	2,800
Do.	Agip Congo S.A., 52%; Société Nationale des Pétroles du Congo, 35%; Sasol Ltd., 13%	Djambala Field	1,500
Do.	Zetah Maurel & Prom Congo S.A.R.L. [Maurel & Prom, 50%; Heritage Congo Ltd., 25%; Tacoma Resources Ltd. (subsidiary of Burren Energy PLC), 25%]	Kouakouala Field	500
Do.	Zetah Maurel & Prom Congo S.A.R.L. [Maurel & Prom, 65%, and Tacoma Resources Ltd. (subsidiary of Burren Energy PLC), 35%]	Pointe-Indienne Field	50

[1]Plant rehabilitation underway.

[2]The sale of the stock of the Nuevo Congo Co. that had been owned by Nuevo Energy Co. of the United States to Perenco S.A. was completed in July 2004 by Plains Exploration & Production Co., which merged with Nuevo Energy Co. in May 2004.

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THE MINERAL INDUSTRY OF CONGO (KINSHASA)

By Thomas R. Yager

The Democratic Republic of the Congo (Congo [Kinshasa]) was a producer of cobalt, columbium (niobium) and tantalum, copper, germanium, gold, and tin ores, and small amounts of steel and refined cobalt. The country also produced cement, crushed stone, diamond and colored gemstones, coal, and crude petroleum. Congo (Kinshasa) had substantial resources of zinc but has not been a producer since 2002.

In 2004, the nominal gross domestic product (GDP) based on purchasing power parity of Congo (Kinshasa) amounted to about $37 billion; the per capita GDP was about $630. The real GDP increased by 6.8% in 2004 compared with 5.7% in 2003. The mining sector accounted for 10% of the GDP; manufacturing, 5%; construction and public works, 4%; and electricity and water, 3%. In 2004, the mining sector grew by an estimated 16% compared with 13% in 2003 and 10% in 2002 (International Monetary Fund, 2005a, p. 60, 62; 2005b, p. 212; 2005§[1]).

In spite of the signing of a peace agreement and the formation of a transitional Government in 2003, civil unrest continued in eastern Congo (Kinshasa) in 2004. The control of natural resources, especially tin mines, allegedly played an important role in the conflict between the Mai-Mai militia and Rassemblement Congolais pour la Démocratie-Goma (RCD-G) in June and September 2004, and between the Government and RCD-G in December. In the second half of 2004, the control of the Djalasiga gold mine in Ituri Province allegedly played an important role in the conflict between the Front des Nationalistes et Integrationistes and the Forces Armées du Peuple Congolais, which were local militias (Global Witness, 2005, p. 8, 16; Human Rights Watch, 2005, p. 94-96).

Commodity Review

Metals

Cobalt and Copper.—Congo (Kinshasa) was one of the world's leading cobalt producers. Mine production of cobalt rose to 8,900 metric tons (t) in 2004 from 7,300 t in 2003, and refined cobalt production fell to 735 t in 2004 from 1,200 t in 2003. In 2004, mine production of copper increased to 73,300 t from 59,800 t in 2003 (table 1).

First Quantum Minerals Ltd. of Canada produced copper ore from the Lonshi Mine; the company shipped its ore across the border with Zambia to the Bwana Mkubwa solvent extraction-electrowinning facility. In 2004, the Lonshi Mine produced 669,000 t of ore at a grade of 5.5% copper compared with 711,000 t of ore at a grade of 4.8% copper in 2003. Bwana Mkubwa produced 41,546 t of copper in 2004 compared with 29,513 t in 2003; the increase was partially attributable to a new ore delivery system. Production at Bwana Mkubwa was expected to be between 40,000 t and 45,000 t in 2005 (First Quantum Minerals Ltd., 2005).

In May 2004, First Quantum announced that resources at the Frontier deposit (formerly known as the Lufua deposit) amounted to 87.6 million metric tons (Mt) at a grade of 1.17% copper. The company planned to complete an updated resource estimate in the first half of 2005 (First Quantum Minerals Ltd., 2005).

Anvil Mining Ltd. of Australia operated the Dikilushi copper mine, which is located near Lake Mweru in Katanga Province. The company exported copper concentrates from the Dikilushi Mine to Namibia for smelting. In 2004, Anvil produced 12,074 t of copper from 270,000 t of ore compared with 13,875 t of copper from 274,000 t in 2003. The increase in the recovery rate to 81% in the fourth quarter of 2004 from 68% in the fourth quarter of 2003 was more than offset by lower grades of ore. In August 2004, Anvil completed a 50% expansion that raised the production capacity to 20,000 metric tons per year (t/yr) of copper (Anvil Mining Ltd., 2004a, p. 5; 2005).

In November 2004, Anvil announced that it had signed a joint-venture agreement with the state-owned Generale Des Carriers Et Des Mines (Gecaminés) and Emiko sprl for the Mutoshi copper-cobalt project near Kolwezi. Anvil agreed to purchase a 70% share in the project; the company planned to produce 25,000 t/yr of copper from the Kulumaziba deposit starting at the end of 2005. In November, Anvil also signed a joint-venture agreement with Gecaminés and Emiko to carry out a feasibility study on the Kinsevere and the Nimbulwa copper-cobalt deposits in Katanga Province (Anvil Mining Ltd., 2005).

Gecaminés and its joint-venture partners produced 19,700 t of copper in 2004 compared with 16,400 t in 2003 and 29,600 t in 1999. The company's production has been inhibited by aging equipment; a lack of investment, fuel, and spare parts; and poor infrastructure (International Monetary Fund, 2005a, p. 66).

Adastra Minerals Inc. of the United Kingdom (formerly American Mineral Fields Inc.) was engaged in a joint venture with Gecaminés to develop the Kolwezi tailings project. The companies planned an initial production level of 30,000 t/yr of copper and 5,000 t/yr of cobalt. Resources were estimated to be nearly 113 Mt at grades of 1.49% copper and 0.32% cobalt (Adastra Minerals Inc., 2004b).

Central African Mining and Exploration Company plc (CAMEC) of the United Kingdom and Enterprises Swanepoel were engaged in a joint venture to build a cobalt processing plant at Kambove. Production was expected to start in the second half of 2005; initial capacity was expected to be 1,200 t/yr of cobalt in concentrates. CAMEC planned to increase capacity to nearly 2,900 t/yr (Central African Mining and Exploration Company plc, 2004).

Gold.—Artisanal and small-scale miners produced gold in Ituri Province in eastern Congo (Kinshasa). National gold production was estimated to be 5,700 kilograms (kg) of gold in 2004 compared with 4,100 kg in 2003 and 7,200 kg in 2000 (table 1).

[1]References that include a section mark (§) are found in the Internet References Cited section.

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In February 2004, Moto Goldmines Ltd. of Australia commenced exploration for gold in the Kilo Moto goldfield in Ituri Province. The Moto Project included the Durba-Karagba, the Gorumbwa, the Kibali, the Ndala, the Pakaka, the Pamao, and the Tete Bakangwe deposits. In October, the company reported that resources at Gorumbwa, Kibali, and Pakaka were 43 Mt at a grade of 3.1 grams per metric ton (g/t) gold. Moto planned to complete a resource estimate that included Durba-Karagba, Ndala, Pamao, and Tete Bakangwe in the first quarter of 2005. Prefeasiblity work was expected to start in early 2005 (Moto Goldmines Ltd., 2004).

Banro Corp. of Canada held the Kamituga, the Lugushwa, the Namoya, and the Twangiza properties in eastern Congo. Measured and indicated resources of contained gold for these properties were estimated to be nearly 63,000 kg. The company began exploration at Namoya in December 2004. Banro planned a $10 million exploration program for Kamituga, Lugushwa, Namoya, and Twangiza to double the measured and indicated resources. The company also planned an initial scoping study for Twangiza for the second half of 2005 (Tassell, 2005).

In December 2003, CAMEC was awarded exploration licenses at Moba that covered 3,250 square kilometers (km^2). In 2004, the company's exploration focused on the Lufuka River Valley, which was in the Tanganyika District of Katanga Province (Central African Mining and Exploration Company plc, 2004).

Silver.—Anvil produced silver as a coproduct at the Dikilushi copper mine. In 2004, silver production amounted to 32,953 kg compared with 35,501 kg in 2003 and 2,108 kg in 2002. Production fell because of lower ore grades. In August 2004, the company completed a 50% expansion that raised production capacity to 50,000 kilograms per year of silver (Anvil Mining Ltd., 2004, p. 5; 2005).

Tin.—Artisanal miners produced cassiterite at Kalima in Maniema Province, at the Bisuru Bibatama Mine near Masisi and the Bisie Mine near Walikale in Nord Kivu Province, and at Miki in Sud Kivu Province. National tin mine production increased to an estimated 2,100 t in 2004 from 800 t in 2003 and 50 t in 2000 because of rising global demand for tin. The increase in demand was partially attributable to environmental regulations in Europe and Japan that mandated the reduction of lead use in printed circuit boards. Most production was unreported and smuggled out of the country through Rwanda (Global Witness, 2005, p. 4, 14).

In December 2004, Metal Processing Association (MPA) signed an exclusive marketing deal with the state-owned mining company Société Aurifère de Kivu et Maniema for all cassiterite production and exports through the end of 2009. MPA was also awarded 37 concessions in eastern Congo (Kinshasa) that it planned to bring into production in 2005 or 2006. The company planned to spend $30 million to build a new smelter with a capacity of 5,000 t/yr. MPA expected to export 400 t/yr of tin to South Africa and substantial amounts to China (Global Witness, 2005, p. 20).

In December 2003, CAMEC was awarded exploration licenses that covered 5,000 km^2 in Katanga Province; these properties were located near cassiterite mines. CAMEC was also considering the development of a small tin mining and smelting operation. The project was expected to produce 240 t/yr of tin; CAMEC planned to make a decision by the first quarter of 2005 (Central African Mining and Exploration Company plc, 2004).

Zinc and Germanium.—In August 2004, Adastra resumed negotiations with Gecaminés on an agreement to resume production of zinc at the Kipushi Mine in Katanga Province. Measured and indicated resources at Kipuhsi were 16.9 Mt at grades of 16.7% zinc and 2.2% copper (Adastra Minerals Inc., 2004a).

Gecaminés and Enterprises Swanepoel Ltd. were in a joint venture to develop a project to reprocess zinc and germanium tailings near Kolwezi. Resources were estimated to be 1 Mt at grades of 20% zinc, 500 g/t germanium, and 200 g/t silver. CAMEC had the option to participate in this project; the company planned to make a decision by mid-2006 (Central African Mining and Exploration Company plc, 2004, undated§).

Industrial Minerals

Cement.—Congo (Kinshasa) had four cement plants with a combined capacity of nearly 930,000 t/yr. Cement production rose to 402,500 t in 2004 from 331,000 t in 2003 and 173,000 t in 1999. The increase may have been attributable to rapid growth in the construction industry (International Monetary Fund, 2005a, p. 62, 66).

Diamond.—National diamond production increased to nearly 30.9 million carats in 2004 from 27 million carats in 2003 and 20.1 million carats in 1999. Exports of diamond amounted to $828 million in 2004, or nearly 46% of total exports (International Monetary Fund, 2005a, p. 66, 86).

The state-owned Sociètè Minièrè de Bakwanga (MIBA) produced mostly industrial and near-gem quality diamond at Mbuji-Mayi in Kasai-Oriental Province. The company produced more than 7.3 million carats in 2004. MIBA planned to increase production to 8.5 million carats in 2006 and 10 million carats in 2008 and to raise the percentage of gem-quality diamond mined to 6% in 2008 from less than 4% in 2003 (Tshofu, 2004; Northwest Territories Department of Industry, Tourism and Investment, 2005, p. 11).

An estimated 700,000 artisanal miners produced diamond at Luozi in Bas-Congo Province; at Gbadolite, Kota-Koli, and Yakoma in Equateur Province; at Bafwansende and Kisangani in Haut-Congo Province; at Lubutu in Maniema Province; and at various operations in Bandundu, Kasai-Occidental, and Nord Kivu Provinces. Reported artisanal diamond production increased to 22.1 million carats in 2004 from 19.1 million carats in 2003 and 15.3 million carats in 1999. The increase in reported production was attributable to the Government's participation in the Kimberley Process certification program for eliminating trade in conflict diamond and the abolition of the diamond export monopoly granted to International Diamond Industries (International Monetary Fund, 2005a, p. 48-49, 66).

In May 2004, SouthernEra Diamonds Inc. of Canada reported that it had been awarded 41 exploration licenses near Mbuji-Mayi that covered 13,000 km^2; these properties were prospective for primary and alluvial deposits. By October,

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SouthernEra had engaged in exploration for kimberlites on 21 of these properties. The company also was awarded exploration permits in the Tshikapa/Kasai/Luebo alluvial diamond field in Kasai-Occidental Province and another alluvial diamond field in Kasai-Oriental Province. SouthernEra planned a systematic exploration program for alluvial diamond in early 2005 (Tassell, 2005).

CAMEC was awarded exploration licenses for properties that covered 12,000 km^2 in the Sankuru District of Kasai Province in April 2004. The company subsequently engaged in exploration at these properties and planned the acquisition of new properties covering 2,150 km^2. In August, Gravity Diamonds Ltd. of Australia signed a joint-venture agreement with BHP Billiton Ltd. of Australia to explore BHP's properties in the Kasai Craton. In October, BRC Diamond Corp. of Canada was awarded 13 exploration licenses for diamond in the Luabo District of Kasai Province; these properties covered about 4,900 km^2 (Central African Mining and Exploration Company plc, 2004; Tassell, 2005).

Gemstones.—Tourmaline was produced from granitic pegmatites in eastern Congo (Kinshasa). Most of these pegmatites were in the rare-metal class and were associated with Early Proterozoic granites. Pegmatites in eastern Congo (Kinshasa) were found in the Katanga, Nord Kivu, and Sud Kivu Provinces. In early 2004, a mine in an undisclosed location produced an estimated 20 to 30 kilograms per month of tourmaline; production appears to have decreased later in the year. A 3-kg sample from this mine was 30% gem-quality, 60% cabochon-quality, and 10% bead-quality. Most of the tourmaline was green; blue-green, yellow-green, and pink rough also was produced (Laurs, Simmons, and Falster, 2004)

Mineral Fuels

Petroleum.—Perenco S.A. of France and its joint-venture partners produced crude petroleum from fields that included the Liawenda and the Tschiende; Total S.A. of France also produced petroleum. Crude petroleum production increased to 10.1 million barrels (Mbbl) in 2004 from 9.2 Mbbl in 2003 and 8.7 Mbbl in 1999. Exports of crude petroleum amounted to $360 million in 2004, or 20% of total exports (International Monetary Fund, 2005a, p. 86).

Congo's only petroleum refinery shut down in 1999; the country relied on imports to meet its petroleum product requirements. In 2004, imports of petroleum products amounted to $130 million, or 6% of total imports (International Monetary Fund, 2005a, p. 87).

Outlook

Production of cobalt, copper, diamond, germanium, gold, and tin in Congo (Kinshasa) could rise and zinc production could restart in the near future. Cobalt and copper production could increase because of the Kambove, the Kolwezi tailings, and the Mutoshi projects; diamond, because of the expansion of MIBA's operations; gold, because of the Moto project; tin, because of new smelters proposed by CAMEC and MPA; and zinc and germanium, because of the Kipushi and the Kolwezi projects. The development of these projects depended heavily upon political and economic stability and favorable conditions in world markets. The outlook for gold and tin was particularly dependent upon political stability because of continued civil unrest in eastern Congo (Kinshasa).

References Cited

Adastra Minerals Inc., 2004a, Adasta seeks to revitalize Kipuhsi Project: London, United Kingdom, Adastra Minerals Inc. press release, August 13, 2 p.

Adastra Minerals Inc., 2004b, Initial Kolwezi production levels determined: London, United Kingdom, Adastra Minerals Inc. press release, December 20, 2 p.

Anvil Mining Ltd., 2004, Annual report 2003: West Perth, Australia, Anvil Mining Ltd., 60 p.

Anvil Mining Ltd., 2005, Report for quarter ended December 31, 2004: West Perth, Australia, Anvil Mining Ltd. press release, January 28, 5 p.

Central African Mining and Exploration Company plc, 2004, Interim results for the six months ended 30 September 2004: London, United Kingdom, Central African Mining and Exploration Company plc press release, December 29, 13 p.

First Quantum Minerals Ltd., 2005, First Quantum Minerals reports operational and financial results for three months and year ended December 31, 2004: Vancouver, British Columbia, Canada, First Quantum Minerals Ltd. press release, 12 p.

Global Witness, 2005, Under-mining peace—The explosive trade in cassiterite in eastern DRC: Washington, DC, Global Witness Publishing Inc., 39 p.

Human Rights Watch, 2005, The curse of gold: New York, New York, Human Rights Watch, 159 p.

International Monetary Fund, 2005a, Democratic Republic of the Congo—Selected issues and statistical appendix: Washington, DC, International Monetary Fund, October 14, Country Report No. 05/373, 97 p.

International Monetary Fund, 2005b, World economic outlook—Building institutions: Washington, DC, International Monetary Fund, September, 293 p.

Laurs, B.M., Simmons, William, and Falster, Alexander, 2004, Gem tourmaline from Congo: Gems & Gemology, v. 40, no. 3, Fall, p. 263-265.

Moto Goldmines Ltd., 2004, Moto Gold Project resource estimate: Balcatta, Australia, Moto Goldmines Ltd. press release, October 28, 2 p.

Northwest Territories Department of Industry, Tourism and Investment, 2005, 2005 Diamond industry report—Diamond facts: Yellowknife, Northwest Territories, Canada, Northwest Territories Department of Industry, Tourism and Investment, 36 p.

Tassell, Arthur, 2005, DRC's minerals rush continues: African Mining, v. 10, no. 1, January/February, p. 42-49.

Tshofu, C.S., 2004, La Miniére de Bakwanga (MIBA), 2004, Presentation at Indaba 2004: Africa Mining Investment Conference, Cape Town, South Africa, February 10-12, 2004, Presentation, 19 p.

Internet References Cited

Central African Mining and Exploration Company plc, [undated], Zinc/Germanium tailings, accessed December 14, 2005, at http://www.camec-plc.com/Operations/zinc_germanium_ tailings _ 01.php#.

International Monetary Fund, 2005 (September), South Africa, World Economic Outlook Database, accessed December 16, 2005, via http://www.imf.org/external/pubs/ft/weo/2005/ 02/data/index.htm.

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TABLE 1

CONGO (KINSHASA): PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
METALS						
Cobalt:						
Mine output, Co content[2, 3]		11,000 e	11,600 r	11,900 r	7,300 r	8,900
Metal, Co content[4]		4,320	3,199 r	2,149 r	1,200 r	735
Columbium (niobium) and tantalum:						
Columbite-tantalite concentrate:[5]						
Gross weight		450	200 e	100 e	50	50
Nb content[e]		130	60	30	25	25
Ta content		130	60	30	25	25
Copper:						
Mine output, Cu content		30,800 r	37,800 r	34,000 r, e	59,800 r	73,300
Metal, primary:						
Smelter, electrowon (low grade)		33,000 r	25,000 r	10,000 r	8,000	20,000
Refined, electrolytic		-- r	-- r	-- r	-- r	--
Germanium	kilograms	--	--	3,500	2,500	2,500
Gold[e]	do.	7,200 r	6,100 r	7,600 r	4,100 r	5,700
Silver	do.	--	--	2,108 r	35,501 r	32,953
Steel[3]		159,000	307,000 r	150,000 r	140,000 r	130,000
Tin[e]		50	200 r	250 r	800 r	2,100
Zinc, mine output, Zn content		-- r	1,014	--	--	--
INDUSTRIAL MINERALS						
Cement, hydraulic[3]		169,000	201,000	265,000 r	331,000	402,500
Diamond:[3, 6]						
Artisanal	thousand carats	11,366 r	11,843 r	15,629 r	19,142 r	22,128
Large-scale	do.	4,640 r	6,355 r	6,050 r	7,839 r	8,752
Total	do.	16,006 r	18,198 r	21,679 r	26,981 r	30,880
Lime[e]		25,000	25,000	25,000	25,000	25,000
Stone, crushed[3]		191,000 r	185,000 r	194,000 r	203,000 r	213,000
Sulfuric acid[e]		80,000	80,000	80,000	80,000	15,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous[e]		--	1,000	1,000	1,000	1,000
Petroleum, crude[3]	thousand 42-gallon barrels	8,500	9,400 r	8,400 r	9,200 r	10,100

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. -- Zero.

[1]Table includes data available through December 20, 2005.

[2]Includes mine production and reprocessed tailings.

[3]Reported data from International Monetary Fund Country Report No. 05/373, October 2005.

[4]Salable refined production only; excludes white alloy and matte.

[5]Columbite-tantalite concentrates are produced by artisanal miners, but data on production are speculative and unreliable for estimating.

[6]An estimated 20% of total diamond is gem quality; the majority of production is from artisanal mining.

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The Mineral Industry of Djibouti

By Thomas R. Yager

Djibouti, which is a small East African country located at the southern end of the Red Sea, was a producer of salt and such construction materials as basalt. Other mineral occurrences of potential economic interest included diatomite, geothermal fluids and mineral salts, gold, gypsum, perlite, petroleum, and pumice.

In 2004, Djibouti's gross domestic product (GDP) amounted to about $1.6 billion based on purchasing power parity. The GDP increased by 3% in 2004 after rising by 3.5% in 2003. Construction and public works accounted for 6% of the GDP; electricity and water, 5%; and manufacturing and mining, 3% (Banque Centrale de Djibouti, 2005, p. 29; International Monetary Fund, 2005, p. 208; 2005§[1]).

In February 2004, Westgold Resources NL of Australia and Green River Geology Co. Pty. Ltd. formed a joint venture to explore for gold on two properties in Djibouti. Preliminary exploration work started in the first half of 2004 (Westgold Resources NL, 2004).

Salt production started on a semi-industrial scale at Lake Assal in 1998. Production was 128,494 metric tons (t) in 2003 compared with 162,266 t in 2002. Low iodine content and high transportation costs inhibited production. In October 2003, Ethiopia imposed a 53% tariff upon imports of salt from Djibouti, which led to a sharp decline in Djibouti's salt production and exports in 2004 (Harris, 2004; Banque Centrale de Djibouti, undated, p. 20-21).

Djibouti did not have production facilities for petroleum products; all petroleum demand was met through imports. In 2004, state-owned Electricité de Djibouti produced 266.6 gigawatthours (GWh) from four diesel-fired powerplants compared with 263.6 GWh in 2003 and 192.2 GWh in 1999. From 1999 to 2004, total consumption of electricity increased to 223.9 GWh from 141.4 GWh. During the same period, industrial consumption rose to 116.2 GWh from 66.7 GWh. In 2004, the African Development Bank loaned Ethiopia and Djibouti $32 million and $27 million, respectively, to connect their power grids (United Nations Integrated Regional Information Networks, 2004; Banque Centrale de Djibouti, 2005, undated, p. 17).

The high cost of electricity impeded the development of the mining and construction materials sectors. The Government planned to develop renewable energy sources to lower costs. Resources of geothermal energy have been estimated to be between 230 and 860 megawatts (MW). Geothermal areas include Arta, Assal, Bock, Dorra, Gaggade Plain, Hanle Plain, the Lake Abbe area, and Tadjourah. Assal's wind-power capacity was estimated to be 100 MW (Business Council for Sustainable Energy, 2003, p. 47-49; International Monetary Fund, 2004, p. 59-60).

Djibouti's road network was about 1,300 kilometers (km) in 2004, of which 330 km was paved. The Djibouti-Ethiopia rail line was 800 km, of which 100 km was in Djibouti. The roads and railway suffered from lack of maintenance (International Monetary Fund, 2004, p. 54-55).

Outlook

The outlook for Djibouti's mineral industry is for little growth in the short run; constraints include small domestic markets and minimal identified natural resources. According to predictions by the International Monetary Fund (2005, p. 208), the GDP would increase by 3.9% in 2005 and 4.3% in 2006.

References Cited

Banque Centrale de Djibouti, 2005, Bulletin trimestrial (4ème Trimestre 2004) [Quarterly Bulletin (4th quarter 2004)]: Djibouti, Djibouti, Banque Centrale de Djibouti, 8 p. plus appendicies.

Banque Centrale de Djibouti, [undated], Rapport annuel 2003 [Annual report 2003]: Djibouti, Djibouti, Banque Centrale de Djibouti, 65 p.

Business Council for Sustainable Energy, 2003, Market assessment report—Eastern Africa Geothermal Market Acceleration Conference, Nairobi, Kenya, April 9-11, 2003: Arlington, Virginia, Business Council for Sustainable Energy, 138 p.

Harris, Ed, 2004, Djibouti's salt industry struggles toward rebirth: Reuters press release, August 10, 2 p.

International Monetary Fund, 2004, Republic of Djibouti—Poverty strategy reduction paper and joint staff assessment: Washington, DC, International Monetary Fund, May 25, 186 p.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

United Nations Integrated Regional Information Networks, 2004, Ethiopia-Djibouti—Power links to boost electricity supply: United Nations Integrated Regional Information Networks press release, December 14, 1 p.

Westgold Resources NL, 2004, Report for the quarter ended 30 June 2004: Perth, Australia, Westgold Resources NL, 4 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Djibouti, World Economic Outlook Database, accessed Ausgust 15, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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TABLE 1
DJIBOUTI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2000	2001	2002	2003	2004[e]
Salt	135,933	173,099	162,266	128,494 [r]	30,000

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised.
[1]Includes data available through March 28, 2005.

TABLE 2
DJIBOUTI: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Salt	Société du Lac, Société Moussa Ali, Société Saline de Djibouti, and Société Sel de Djibouti (combined capacity)	Mines at Lake Assal	145,000 [e]
Do.	Other companies	do.	30,000 [e]

[e]Estimated; estimated data are rounded to no more than three significant digits.

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The Mineral Industry of Egypt

By Harold R. Newman

In 2004, the mineral fuels sector continued to be a vital segment of and a major contributor to the economy of Egypt. Petroleum and petroleum products comprised the top export commodities in 2004. Mineral industry efforts were focused mainly on the further development of the country's petroleum and natural gas resources. Egypt was one of the world's top 20 energy-producers, and the mineral fuels sector, which was the single largest industrial activity in the country, accounted for 95% of the primary energy requirements, 30% of total exports, and 8% of the gross domestic product (GDP) (Summit Communications, 2004§[1]).

Economic development was placing stress on Egypt's environment. Population density combined with postponed infrastructure investment had overwhelmed water and wastewater services and created environmental hazards. The main environmental issues Egypt faced were air pollution, carbon dioxide emissions, energy consumption, and preservation of coastal areas. Also, the Nile River and its tributaries were being contaminated with chemicals, heavy metals, and pollutants (U.S. Energy Information Administration, 2004§).

Egypt's estimated GDP based on purchasing power parity was about $282 billion. The estimated GDP per capita based on purchasing power parity was $4,072. The estimated annual inflation rate was 8%, and the estimated growth rate was 4.3% (International Monetary Fund, 2005§). The country had a land area of 1,001,450 square kilometers (km^2) and an estimated population of 78 million (U.S. Central Intelligence Agency, 2005§).

Egyptian Geological Survey and Mining Authority (EGSMA) is the Government agency responsible for regulating the exploitation, exploration, and prospecting of all mineral deposits in Egypt. The laws that regulate the mining sector are the Mining and Petroleum Code law No. 66 of 1953 and the Mining Code laws No. 86 and No. 151 of 1956. The Ministry of Petroleum and the Ministry of Electricity and Energy are the main Government agencies responsible for the energy sector.

The Organization for Energy Planning is the Government office responsible for analyzing energy policies and energy supply and demand, evaluating energy resources, and developing technical expertise in the field. Government-owned Egyptian Electric Holding Company is responsible for the country's power generation and owns distribution companies.

Besides mineral fuels, Egypt also produced aluminum, ferroalloys, gold, iron ore, lead, secondary copper, steel, and zinc. Industrial minerals produced included construction materials, gypsum, and raw materials for glass.

[1]References that include a section mark (§) are found in the Internet References Cited section.

Commodity Review

Metals

Gold.—Centamin Egypt Ltd. of Australia was a mineral exploration company that had been exploring for gold in Egypt since 1995. From 1977 through 1995, extensive geologic mapping, prospecting, and sampling were carried out. Centamin had a 160-km^2 exploitation lease for the Sukari Hill gold project and, in 2004, Centamin selected the Sukari Hill project as the first project for development owing primarily to its proximity to infrastructure. The project was part of Centamin's Eastern Desert concession, which also included the Abu Marawat, the Baramiya, and the Hamama deposits. The Sukari Hill deposit is located in the Sukari area and is a 2.5-kilometer (km)-long outcropping porphyry granite hill that is situated about 700 km south of Cairo and 25 km west of Marsa Alam on the Red Sea (Centamin Egypt Ltd., 2004§).

Most gold mineralization at Sukari is related to sulfides; pyrite is the most abundant sulfide, followed by arsenopyrite. The sulfides occur in altered rocks and in quartz veins. At yearend, estimated resources at Sukari were 91,400 kilograms (kg) of gold (reported as 2.94 million troy ounces) with ongoing drilling expected to add to this resource (Centamin Egypt Ltd., 2005§).

Gippsland Ltd. announced that EGSMA had granted it the rights to explore eight gold prospects in the Wadi Allaqi District that is located 160 km southeast of Aswan in the south-western part of the Eastern Desert. The geology of the Wadi Allaqi region comprises the most southerly part of the Late Cambrian Arabian Shield and contains a northwest- and west-trending belt of gabbro/granite complexes, metasedimentary and metavolcanic schist, and ophiolites, which are overlain unconformably by the Nubia Group sandstones of Upper Cretaceous age. Within the 12,000-km^2 Wadi Allaqi area, about 19 historical gold deposits were known. Gippsland's eight gold projects included Haimur, Nile Valley Block A, Nile Valley Block E, Seiga, Umm El Tuyer, Umm Garayat Koleit, Umm Uurayyat, and Umm Shashoba. No mining has been conducted there since the early 1950s (Gippsland Ltd., 2004§).

Iron and Steel.—Egyptian Iron and Steel Co. operated the El-Gedida Mine, which is located about 23 km northeast of the El Bahariya Oasis in the Western Desert, and produced about 2.9 million metric tons (Mt) of limonitic iron ore. All production was captive and shipped by rail to Egyptian Iron and Steel's (Hadisolb) Helwan plant where it was smelted. The open pit mine produced iron ore with a grade of about 52% contained metal and a 43% contained-metal cutoff grade. The ore body was about 7 meters (m) thick and had an estimated 120-Mt reserve. Egypt was an importer of iron ore, although several high-grade deposits had been identified to the southeast of Aswan (United Nations Conference on Trade and Development, 2004).

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Ezz El-Dekheila Group (EZDK) continued with its program of acquisition, consolidation, and investment; it had 5.2 million metric tons per year (Mt/yr) of capacity and was the leading private steelmaker (Metal Bulletin Monthly, 2004).

Because steel demand was expected to remain fairly flat, EZDK targeted the most profitable international markets while anticipating future growth domestically. EZDK's exports in 2004 were valued at $624.6 million and were expected to reach $900 million in 2005 (News Flash, 2004§).

The Government lowered its import tariff on reinforcing steel (rebar) to 5% from 20%. The tariff reduction was effective beginning January 2004. Although this reduction could eventually open up the Egyptian market, the immediate impact was expected to be minimal because rebar prices were significantly lower in Egypt than in other markets. In 2004, rebar was sold for $350 per metric ton in Egypt compared with between $370 and $380 per metric ton in Saudi Arabia and other local markets. The antidumping measures for rebar imported from Latvia, Romania, Turkey, and Ukraine were not changed (Metal Bulletin, 2004a).

Voestalpine Schienen, the Austrian steel group's rail division, signed a memorandum of understanding for a licensing agreement, whereby Hadissolb would produce rails in Egypt using Voestalpine technology. The plan was to extend the range of Hadissolb's heavy-section rolling mill so it could make commodity-grade rails up to 36 m long. Voestalpine would arrange for the necessary transfer of know-how and technical support. Hadissolb's integrated steelworks, which was located south of Cairo at Helwan, casted billet, bloom, and slab (Metal Bulletin, 2004b).

Egyptian Ferroalloys Co. (Efaco) produced and distributed ferrosilicon 75% in the domestic and international markets. Efaco's Aswan plant at Edfu was considered to be the leading integrated industrial center for the production of ferrosilicon in the Middle East. The location was chosen because of its closeness to the source of electricity and the availability of pure quartz in the area of Umm Hegleg, which is located about 100 km from Edfu. The production was used in the iron and steel industries. Efaco had four furnaces, each of which had a 50,000-metric-ton-per-year (t/yr) capacity (Egyptian Ferro Alloys Co., 2004§).

Magnesium.—Magnesium International Ltd. (MIL) announced that its proposed 88,000-t/yr magnesium plant would be constructed inside the Sokhna Port at Ain Sokhna, which is located on the Gulf of Suez about 110 km east of Cairo and 50 km south of Suez City. The smelter would be owned and operated by a joint-venture company, Egyptian Magnesium Co. (EMAG). The EMAG project was a joint venture between MIL and Amiral Investments (50% each) (Magnesium International Ltd., 2004§).

The Governments of Egypt and China signed a contract to build a factory to produce magnesium sulfate, which is used to improve soil, as an additive for livestock feed, and as an ingredient for the pharmaceutical industry. This factory would be the first of its kind in the Middle East and was expected to produce 27,000 t/yr of magnesium sulfate, which would be about 5% of world output (American Chamber of Commerce in Egypt, 2004§).

Columbium (Niobium) and Tantalum.—Gippsland Ltd. released the results of the bankable feasibility study (BFS) prepared by Lycopodium Pty. Ltd. for its 40 Mt of estimated reserves of ore at its Abu Dabbab tantalum-tin project. The BFS was based upon a design throughput of 1.26 Mt/yr and evaluated the project for the first 20 years of mine life. Gippsland estimated that the project would produce about 300 t/yr of tantalum pentoxide, which would establish the company as the world's second leading tantalum producer after Australia. About 1,000 t/yr of tin metal in concentrate was also expected to be produced. Tantalum Egypt LLC was the operating company of the joint venture in which Gippsland and the EGSMA each held a 50% interest. Tantalum Egypt also owned the mining license for the estimated 98-Mt Nuweibi tantlum deposit, which is located 17 km from the Abu Dabbab project (Mining Magazine, 2004).

Industrial Minerals

Asbestos.—The Ministry of Foreign Trade announced that, effective January 2005, the import and manufacture of all types of asbestos and asbestos material would be prohibited; the fulfillment of existing contracts would be permitted only under the supervision of the Industrial Control Authority. The decision to ban asbestos was the culmination of a sustained campaign by workers who protested that high levels of occupational asbestos had led to numerous cases of cancer and asbestosis among the workforce (Kazan-Allen, 2004).

Cement.—The main cement producers in Egypt were, in order of capacity, Egyptian Cement Co., Assuit Cement Co., Tourah Portland Cement Co., Suez Cement Co., ASEC Cement Co., National Cement Co., and Alexandria Portland Cement (Arab Union for Cement and Building Materials, 2004§).

The Italcementi Group's Ciments Français S.A. offered $550 million for the Government's 65.9% share in Suez Cement. Ciments Français already owned 39.9% of Suez Cement, which was Egypt's leading cement producer with a market share of about 22%. Egypt's strategic importance in the Mediterranean basin was confirmed by the size of its domestic market, which was about 25 Mt/yr and second only to Turkey in the southeast region. Suez Cement had three production facilities (Quattamiah, Suez, and Tourahall), all of which were equipped with modern kilns and had a total combined capacity of about 8 Mt/yr for the domestic and export markets (International Cement Review, 2004).

Nitrogen.—A large-scale ammonia plant was to be built in the Suez Industrial Zone near the Port of Ain el Sokhna, which would further increase the country's ammonia production and exports. The 2,000-metric-ton-per-day-capacity ammonia plant would be the largest of its kind in Egypt, measured by production quantities. Egypt Basic Industries Co., which was the project company, was composed of Kellogg Brown & Root Inc. (KBR) of the United States, PSK Holdings Pty. Ltd. and Orascom Construction Industries, both local companies, and state-owned Egyptian General Petroleum Corp. (EGPC). The industrial complex was to include a pipeline corridor that connected the ammonia production plant to product storage tanks located in Sokhna Port. The plant design was to be based on KBR's advanced ammonia process (Middle East Economic Digest, 2005).

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The U.S. Trade and Development Agency awarded a $702,000 grant to Egyptian Petrochemicals Holding Co. to finance a feasibility study for a proposed $500 million ammonia/methanol plant. Plans called for a 1.7-Mt/yr plant to be built near Damietta in the Mediterranean Industrial Zone (Middle East Economic Digest, 2004a).

Phosphate Rock.—Red Sea Phosphate Co. was merged with El Nasr Phosphate Co. in 2004 and the name was changed to El Nasr Mining Co. (NMC). The phosphate mines of Abu Zabal Fertilizer Co. were also merged with NMC. As a result, NMC became one of the leading mining companies in Egypt with activities that extended from Alexandria in the north to Aswan in the south. NMC not only mined phosphate rock but also barite, feldspar, gypsum, ilmenite, iron oxide, kaolin, quartz, and talc (El Nasr Mining Co., 2004§).

The Ministry of Industry and Technology's Abu Tartu phosphate project lies in the desert about 50 km west of El Kharga and 650 km south of Cairo. The project consisted of two main production activities: the mine and the beneficiation plant. The Government invited prospective offers for either leasing the mining project and the construction of a chemical/fertilizer complex or leasing the mining project only. The phosphate deposit covered an area of about 1,200 km^2, of which a tenth had been explored geologically. Exploration indicated about 715 Mt of estimated reserves with an average seam thickness of 3.5 m. In 2004, the license for exploration was restricted to an area of about 14 km^2 with estimated reserves of about 65 Mt of fresh phosphates and about 20 Mt of oxidized phosphates, which could be extracted by open pit mining (Ministry of Industry and Trade, 2004§).

Sand and Gravel.—About 15 localities of high-grade silica sand were reported to have been identified. The main deposits were Wadi El-Dakhi and Wadi Qena, which are located in the Eastern Desert; Gebel El-Gunnah, which is located south of Sinai; and El-Maadi, which is located near Cairo. Wadi El-Dakhi was considered to be the largest deposit in the country, but no detailed studies to estimate its reserve had been carried out. Possible resources at Wadi Qena were estimated to be 1 billion metric tons (Gt). Possible resources at Gebel El-Gunnah were estimated to exceed 1 Gt (MBendi Co., 2004§).

Mineral Fuels

Egypt was a transit corridor in the Persian Gulf and had strategic importance because of its operation of the Suez Canal and the Suez-Mediterranean (Sumed) Pipeline. The Government's Suez Canal Authority (SCA) was continuing enhancement and enlargement projects on the canal. SCA was offering a discount on transit fees to liquefied natural gas (LNG) tankers as well as other discounts for oil tankers as an incentive to use the Suez Canal. The Sumed pipeline was an alternative to the Suez Canal for transporting oil from the Persian Gulf region to the Mediterranean. The 200-mile pipeline, which was owned by Egypt, 50%, Saudi Arabia, 15%, Kuwait, 15%, the United Arab Emirates, 15%, and Qutar, 5%, ran from Ain al-Sukhna on the Gulf of Suez to Sidi Kir on the Mediterranean (U.S. Energy Information Administration, 2005§).

EGPC launched its 2004 bid round and released for tender 15 new exploration blocks in the Gulf of Suez, the Nile Delta region, and the Western Desert. The blocks cover an area of 30,804 km^2. Four of the largest concessions (North Quarun, Southeast El-Mansoura, South Mariut, and West Darag Onshore) are located in the Nile Delta, and the largest, West Darag, covers 8,970 km^2 of territory between the Nile and Red Sea coast. Four other blocks are located in the desert to the west of the delta, and seven smaller concessions were on offer in the northern spur of the Gulf of Suez (Middle East Economic Digest, 2004b).

Natural Gas.—Most of Egypt's offshore discoveries have been natural gas and it was the fastest growing mineral fuels sector in 2004. Egypt became an exporter of LNG when its first LNG export terminal began operation in 2004 and the first shipment of LNG left the terminal in January 2005. The country was expected to become a significant exporter of LNG when a second export terminal becomes operational in 2006 (U.S. Energy Information Administration, 2005§).

As of January 2005, the Government's revised estimate of proven natural gas reserves was about 1.9 trillion cubic meters (reported as 66 trillion cubic feet). The International Egyptian Oil Company (a subsidiary of ENI-Agip of Italy) was Egypt's leading natural gas producer. The company operated in the Gulf of Suez, the Nile Delta, and the Western Desert (U.S. Energy Information Administration, 2005§).

Egypt's 270-km natural gas pipeline to Jordan was intended as the first stage of a wider regional network, the Arab Gasline, which would send supplies from Egyptian gasfields to Lebanon and Syria, eventually to Turkey, and perhaps to Cyprus. In 2005, Jordan was to import about 3 million cubic meters from Egypt following construction of a 393-km pipeline extension from Aqaba to the Rehab powerplant in northern Jordan. The proposed extension of pipeline links to Turkey would add substantially to the demand on Egyptian natural gas, as would Israel Electric Corp. (IEC)'s plans to lift Egyptian natural gas from 2006. The East Mediterranean Gas consortium was looking to supply IEC with about 5 million cubic meters during a 15-year sale period. Also, the Palestinian Authority signed a memorandum of understanding with the Egyptian Government to purchase about 9 million cubic meters of natural gas to feed a powerplant in Gaza (African Energy, 2004).

Apache Corp. signed an agreement to sell 58 million cubic meters of natural gas during a 25-year period from its Qasr field to EGPC. Qasr will flow more than 8 million cubic meters per day, which will more than double Apache's existing production. Apache described Qasr as the most significant natural gas discovery in the Western Desert in the past decade and perhaps the most significant in Apache's history (Petroleum Economist, 2004).

Apache announced test results of two new wells in the Qasr field on the Khaida concession. The Qasr-6 well test flowed at a rate of 750,000 million cubic meters per day of natural gas and 1,037 barrels per day (bbl/d) of condensate in two zones in the Jurassic Lower Safa formation. The Qasr-9 well flowed at a rate of 826 bbl/d of crude petroleum and 2,000 cubic meters per day of natural gas, which registered the strongest test to date from the Cretaceous Alam El Bueib sands (Rigzone.com, 2004a§).

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BG Group plc proposed to drill about 25 wells during 2004 and 2005. The figure included the two new production wells it planned to drill in the Simian field in the West Delta Deep Marine (WDDM) concession offshore the Nile Delta. BG stated that it planned to accelerate the drilling schedule for these two wells. Also, BG said that it planned to bring forward the schedule for the first gas from Phase 2 of the Rosetta development (Rigzone.com, 2004b§).

BG announced that it had finalized an agreement for the purchase of Shell Egypt N.V. and Shell Austria GmbH's (collective) interest in the Rosetta concession offshore Egypt. The sale, if approved by the Egyptian Government, would raise BG's equity interest in Rosetta to 80% from 40%. The Rosetta concession includes the producing gasfield and three development leases. The purchase price was reported to be $235 million (Schlumberger Corp., 2004a§).

BP Egypt announced that it had made a new gas discovery in the Western Nile Delta. The Polaris 1 exploratory well was the second discovery in the West Mediterranean Deep Water (WMDW) concession following the Ruby discovery in 2003. Polaris 1 was tested and flowed gas at a rate of 742,000 cubic meters per day from a Mid-Pliocene slope channel at a depth of 2,178 m. BP, which was the operator of the WMDW concession, held an 80% interest, and RWE Dea Egypt held the remaining 20% (Rigzone.com, 2004c§).

BG was increasing its gas exploration and was meeting with other companies in a bid to find supplies for a third Egyptian LNG (ELNG) train planned for construction. BG was undertaking major gas exploration in its WDDM concession and in two blocks in the eastern Nile delta. Any discoveries that were made could serve a third processing plant that the company was considering adding to the two trains under construction at the ELNG Idku site, which is located 50 km from the coastal city of Alexandria. The first 3.6 Mt/yr train was expected to begin operations in 2005 and to deliver its annual output to Gaz de France for 20 years (Platts, 2004§).

The Government announced that Egypt would export, for the first time, an LNG consignment from the Damiett LNG exporting unit to Huelva, Spain, starting in January 2005. Expansions to the Italian and the U.S. markets were expected to start in 2006. Damiett, which was one of the world's largest LNG complexes in terms of capacity, had the capacity to produce 7.5 billion cubic meters per year of natural gas to produce 4.8 Mt/yr of LNG for export. Egypt's export of energy, boosted by LNG exports, was expected to rise to $10 billion by 2010 (Alexander's Gas & Oil Connections, 2004§).

Petroleum.—The Government was expected to begin talks on the possibility of Egypt joining the the Organization of the Petroleum Exporting Countries (OPEC) as a full member. The Government was studying the criteria and procedures for membership in OPEC. Egypt was a modest oil producer but has been attending OPEC meetings as an observer (Schlumberger Corp., 2004b§).

Egyptian petroleum production comes from four main areas: the Gulf of Suez (about 50%), the Eastern Desert, the Western Desert, and the Sinai Peninsula. Estimated annual production of crude petroleum was 219 million barrels in 2004 (table 1). Although there has been a decline in output, exploration activity in new areas may discover sufficient oil to slow the decline. According to the U.S. Energy Information Administration (2005§), consumption of petroleum products has been relatively flat since 1999 owing, in part, to reductions in subsidies for consumption of petroleum products and to the use of compressed natural gas as a fuel for motor vehicles.

The leading producer in the Gulf of Suez was the Gulf of Suez Oil Co. (a joint venture of EGPC and Amoco Corp.). The second ranked producer was Belayim Petroleum Co., which was a joint venture between International Egyptian Oil Co. and EGPC. The third ranked producer was the Suez Oil Co. (U.S. Energy Information Administration, 2004§).

The Government awarded two Canadian companies contracts worth $26 million to explore for oil and gas in a southern Nile River valley. The contracts were awarded to Centurion Energy International and Quadra Resources Corp., which will drill nine wells in the 53,000-km^2 area near Aswan during an 8-year period. This was the first time the Government had awarded contracts in that area (Middle East North Africa Financial Network, Inc., 2004§).

Lukoil Overseas Holdings Ltd. started exploration drilling on the North-East Geisum offshore block. The North-East Geisum Block is located in the Gulf of Suez in the Red Sea. Lukoil acquired the right to work on this block as well as the neighboring West Geisum Block based on a tender organized by EGPC. The combined reserves of the blocks were estimated to be about 184 Mbbl of oil. Five oil and gas prospects had been identified within the blocks (Rigzone.com, 2004d§).

Infrastructure

Projects to enhance and enlarge the Suez Canal continued in 2004. Lukoil Overseas opened a 24,000-bbl/d pipeline to convey crude oil from its West Esh el Mallaha concession near Hurghada to export terminals at Gevbel el Zeit and Ras el Bikhar. The $8 million pipeline, which was designed for continuous operation during a 30-year period, was built by Petrojet Egypt, a local company. Lukoil was finalizing plans for construction of a crude-oil processing facility, which was to be tendered in 2005 (Middle East Economic Digest, 2004c).

Outlook

The Egyptian mineral fuels industry is set to continue to grow during the next 3 to 4 years, mainly as a result of the Government's recent restructuring of the energy sector following several natural gas discoveries. The Government will continue to move forward with its policy to develop the country's hydrocarbon resources. The natural gas sector is expected to expand rapidly as a result of additional output from two LNG export terminals. Although natural gas exports are likely to overtake petroleum exports in the near future, the presence of several foreign companies exploring for petroleum offshore Egypt in 2004 suggests the possibility of further development of the petroleum sector if new discoveries are made.

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References Cited

African Energy, 2004, Regional schemes add to demand on Egyptian reserves: African Energy, February, p. 8.

International Cement Review, 2004, Ciments Français bids for Suez Cement: International Cement Review, issue 80, December, p. 1.

Kazan-Allen, Laurie, 2004, What price the Egyptian asbestos ban: International Ban Asbestos Secretariat, January 19, 3 p.

Metal Bulletin, 2004a, Egypt cuts tariffs on reinforcing steels: Metal Bulletin, no. 8825, January 19, p. 26.

Metal Bulletin, 2004b, Voestalpine signs MoU for Hadisolb to produce rails: Metal Bulletin, no. 8850, July 12, p. 20.

Metal Bulletin Monthly, 2004, EZDK prepares for the next step: Metal Bulletin Monthly, no. 408, December, p. 28.

Middle East Economic Digest, 2004a, ECHEM receives US methanol grant: Middle East Economic Digest, v. 48, no. 28, July 9-15, p. 16.

Middle East Economic Digest, 2004b, EGPC launches 2004 bid round: Middle East Economic Digest, v. 48, no. 28, July 9-15, p. 14.

Middle East Economic Digest, 2004c, WEEM export pipeline opens: Middle East Economic Digest, v. 48, no. 43, October 22-28, p. 15.

Middle East Economic Digest, 2005, KBR-led consortium unveils Suez ammonia plant: Middle East Economic Digest, v. 49, no. 9, March 4-10, p. 17.

Mining Magazine, 2004, Egypt tin and tantalum: Mining Magazine, October, p. 4.

Petroleum Economist, 2004, Africa—Egypt: Petroleum Economist, v. 71, no. 6, June, p. 43.

United Nations Conference on Trade and Development, 2004, The iron ore market 2003-2005: United Nations Conference on Trade and Development, May, p. 24.

Internet References Cited

Alexander's Gas & Oil Connections, 2004, Egypt likely to become sixth-largest exporter of liquefied gas, accessed December 28, 2004, at URL http://www.gasandoil.com/goc/news/nta44772.htm.

American Chamber of Commerce in Egypt, 2004 (June 15), Egypt, China to set up new fertilizer factory in Egypt, accessed June 15, 2004, at URL http://www.amcham.org.eg?BSAC/WatchBullentin/Issue/Jun1504.asp.

Arab Union for Cement and Building Materials, 2004, Cement figures, accessed February 24, 2006, at URL http://www.aucbm.org/arabic/memclck/pdf_stat/ego4.pdf.

Centamin Egypt Ltd., 2004, Sukari gold project, accessed December 7, 2005, at URL http://www.centamin.com.au/projects.php.

Centamin Egypt Ltd., 2005, Welcome to Centamin Egypt Limited, accessed December 7, 2005, at URL http://www.centamin.com.au/home.htm.

Egyptian Ferro Alloys Co., 2004, At a glance, accessed December 22, 2005, at URL http://www.efaco.com.eg/micor/ataglance.asp.

El Nasr Mining Co., 2004, The company, accessed December 12, 2005, via URL http://www.elnasrmining.com/+&hl=en.

Gippsland Ltd., 2004, Projects, accessed February 24, 2006, at URL http://www.gippslandltd.com/p_w_overview.asp.

International Monetary Fund, 2005, Egypt, World Economic Outlook Database, accessed December 1, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbcoutm.cfm.

Magnesium International Ltd., 2004 (December 17), Magnesium International Ltd. confirm Egypt will be the site for their 88,000 tpy magnesium smelter, accessed December 7, 2005, via URL http://www.azom.com/details.asp?newsID=2418.

MBendi Co., 2004 (November 17), Industrial minerals mining, accessed May 19, 2005, at URL http://www.mbendi.co.za/land/af/eg/p0005.htm.

Middle East North Africa Financial Network, Inc., 2004 (July 20), Egypt awards 2 Canadian oil firms contracts for oil, gas exploration, accessed July 22, 2004, at URL http://www.menafn.com/qn_news_story_s.asp?storyid=57981.

Ministry of Industry and Trade, 2004, Abu Tartur phosphate deposit, accessed March 22, 2005, at URL http://www.mitd.gov.eg/sites/abotaor.htm.

News Flash, 2005 (May 31), News and features, accessed February 27, 2006, at URL http://www.cibcegypt.com/cibc/research/researchlibrary.nsf.

Platts, 2004 (October 12), BG looks for gas supply for third LNG train, accessed October 13, 2004, at URL http://www.platts.com/Naturalgas/news/8728468.xml.

Rigzone.com, 2004a (September 7), Apache's Qasr-6 tests 750 thousand cubic meter gas, accessed September 7, 2004, at URL http://www.rigzone.com/news/article.asp?a_id=16138.

Rigzone.com, 2004b (September 24), BG plans to drill about 25 wells in Egypt in 2004/2005, accessed September 27, 2004, at URL http://www.rigzone.com/news/article.asp?a_id=16680.

Rigzone.com, 2004c (July 26), BP makes Western Nile Delta find, accessed September 27, 2004, at URL http://www.rigzone.com/news/article.asp?a_id=15031.

Rigzone.com, 2004d (November 10), Lukoil Overseas starts drilling on Egyptian shelf, accessed November 12, 2004, at URL http://www.rigzone.com/news/article.asp?a_id=17941.

Schlumberger Corp., 2004a (September 6), BG Group pre-empts Rosetta sale, accessed September 7, 2004, at URL http://www.slb.com/news/story.cfm?storyid=620084.

Schlumberger Corp., 2004b (September 20), Egypt's Government mulls joining OPEC, accessed September 20, 2004, at URL http://www.slb.com/news/story.cfm?storyid=620460.

Summit Communications, 2004, Turning up the gas will boost energy sector, accessed March 7, 2005, at URL http://www.summitreports.com/egypt2004/oilgas.htm.

U.S. Energy Information Administration, 2004 (August), Egypt, Environmental Issues, accessed December 14, 2005, at URL http://www.eia.doe.gov/emeu/cabs/egypenv.html.

U.S. Energy Information Administration, 2005 (May), Egypt, Country Analysis Brief, accessed December 14, 2005, at URL http://www.eia.doe.gov/emeu/cabs/egypt.html.

U.S. Central Intelligence Agency, 2005, Egypt, World Factbook 2005, accessed November 1, 2005, at URL http://www.odci.gov/cia/publications/factbook/geos/eg.html.

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TABLE 1
EGYPT: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
METALS						
Aluminum metal	metric tons	189,000	191,000 r	195,000	194,600 4	215,000
Copper, refined, secondary	do.	4,000	4,000	4,000	14,119 r, 4	14,000
Iron and steel:						
Iron ore and concentrate		1,900 4	2,600 r, 4	2,618 r, 4	2,237 r, 4	2,900
Metal:						
Pig iron		1,400	1,400	1,700	10 4	1,700
Direct reduced iron		2,110	2,370	2,530	2,900	2,600
Steel, crude		2,838 4	3,799 4	4,316 4	4,398 r, 4	4,400
Ferroalloys:						
Ferromanganese		30	30	30	30	30
Ferrosilicon		55	55	55	55	55
Manganese ore	metric tons	20,000	20,000	20,000	20,000	20,000
Titanium, ilmenite		125	125	125	120 4	120
INDUSTRIAL MINERALS						
Asbestos	metric tons	2,000 r	2,000 r	2,000 r	2,000 r	--
Barite		500	500	500	500	500
Cement, hydraulic, all types		24,143 4	25,700	28,155 4	26,639 4	28,763 4
Clays:						
Bentonite		50	50	50	26 r, 4	30
Fire clay		300	300	300	300	300
Kaolin	metric tons	290,000	260,000	260,000	260,000	260,000
Feldspar, crude	do.	330,000	300,000	350,000	350,000	350,000
Fluorspar	do.	500	500	500	500	500
Gypsum and anhydrite, crude		2,000	2,000	2,000	792 4	1,000
Lime		800	800	800	800	800
Nitrogen:						
Ammonia, N content		1,511 4	1,801 4	1,839 4	1,790 4	1,652 4
Urea, N content		853 4	1,091 4	1,078 4	1,134 4	1,078 4
Phosphate:						
Phosphate rock		1,096 4	972	1,500	2,183 r, 4	2,219 4
P_2O_5 content		317	293	434	630	650
Sodium compounds:						
Salt		2,400	2,400	2,400	1,341 r, 4	1,400
Soda ash		50	50	50	50	50
Sodium sulfate	metric tons	2,500	2,500	2,500	2,500	2,500
Stone, sand and gravel:						
Basalt	thousand cubic meters	300	300	300	300	300
Dolomite		3,500	3,000	3,000	3,000	3,000
Granite, dimension stone	cubic meters	40,000	40,000	40,000	40,000	40,000
Gravel	thousand cubic meters	12,000	11,000	11,000	11,000	11,000
Limestone and similar	do.	27,000	25,000	25,000	25,000	25,000
Marble (includes alabaster) blocks	cubic meters	140,000	140,000	140,000	140,000	140,000
Sand:						
Industrial sand (glass sand)		600	600	600	640 4	650
Construction sand		22,000	21,000	21,000	21,000	21,000
Sandstone	thousand cubic meters	--	10	10	10	10
Sulfur:						
Elemental, byproduct	metric tons	4,500	4,500	4,500	4,500	4,500
Sulfuric acid, S content		220	220	220	220	220
Talc, soapstone, pyrophyllite	metric tons	40,000	40,000	45,529 r, 4	40,000	40,000
Vermiculite	do.	12,000	12,000	12,000	12,000	12,000
MINERAL FUELS AND RELATED MATERIALS						
Coal		39	58	58	139 r, 4	100
Coke		1,400	1,400	1,400	1,406 r, 4	1,400

See footnotes at end of table.

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TABLE 1--Continued
EGYPT: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
MINERAL FUELS AND RELATED MATERIALS--Continued						
Gas, natural:						
Gross production	million cubic meters	25,000	30,100 r	27,700	30,969 [4]	31,000
Dry	do.	21,000	24,550 [4]	19,605 r	17,680 r, [4]	18,000
Petroleum:						
Crude, including condensate	thousand 42-gallon barrels	285,000	277,000	221,350 [4, 5]	221,219 [4, 5, 6]	219,000
Refinery products:						
Liquefied petroleum gas	do.	5,500	5,500	6,705 [4]	6,763 [4, 5, 7]	6,800
Gasoline and naphtha	do.	45,000	45,000	51,572 [4]	53,210 [4, 5, 8]	54,000
Kerosene and jet fuel	do.	16,000	16,000	19,579 [4]	19,335 [4, 5]	20,000
Distillate fuel oil	do.	46,000	46,000	57,457 [4]	61,060 [4, 5]	61,000
Residual fuel oil	do.	83,000	83,000	66,687 [4]	68,884 [4, 5]	69,000
Lubricants	do.	1,800	1,800	1,960 [4]	1,855 [4, 5]	1,900
Asphalt	do.	6,000	6,000	5,484 [4]	5,709 [4, 5]	5,800
Unspecified[9]	do.	1,700	1,700	2,139 [4]	2,155 [4, 5]	2,200
Total	do.	205,000	205,000	211,583 r, [4]	218,971 r, [4, 5]	219,000

rRevised. -- Zero.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through November 1, 2005.

[3]In addition to those listed, Egypt produced a number of commodities for which data were unavailable; these include gemstones, and some metals, such as gold and lead, which were produced from recycled material; zinc; and manufactured mineral commodities, such as carbon black and glass.

[4]Reported figure.

[5]Source: Ministry of Petroleum of the Arab Republic of Egypt.

[6]Excluding condensate.

[7]Excluding product from fields.

[8]Gasoline only.

[9]Amounts needed to complete reported refinery products totals shown.

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TABLE 2
EGYPT: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilites	Annual capacity
Aluminum		Aluminium Co. of Egypt (Government, 80%, and private interests, 20%)	Nag Hammadi	230.
Carbon black		Alexandria Carbon Black Co. (Egyptian Holding Co. for the Chemical Industry, 49%; Inco-Bharat, 36%; Grasim Industries 15%)	Alexandria	20.
Cement		Amirya Cement Co.	do.	2,500.
Do.		Cemex Egypt	Assiut	5,000.
Do.		Helwan Portland Cement Co. (Government, 73%, and private interests, 27%)	Helwan	2,800.
Do.		do.	El Minya	200.
Do.		Egyptian Cement Co. (Orascom Group, 40%; private interests, 40%; Holderbank Financiere Glaris Ltd., 20%)	70 kilometers east of Cairo	1,400.
Do.		Suez Cement Co. (Government, 65.9%, and Ciments Français, S.A., 34.1%)	Suez	3,000.
Do.		do.	Qattamiah	2,500.
Do.		do.	Tourah	2,500.
Do.		Alexandria Portland Cement Co. (Government, 77%, and private interests, 23%)	El Mex	800.
Do.		National Cement Co. (Government, 77%, and private interests, 23%)	El Tabbin	4,000.
Do.		do.	Beni Suef	1,000.
Fertilizers, nitrogenous		Abu Qir Fertilizer & Chemical Industries Co., [private and public interests, 80.9%, and Egyptian General Petroleum Corp. (EGPC), 19.1%]	Abu Qir A	660 (ammonia); 760 (ammonia nitrate).
Do.		do.	Abu Qir B	300 (ammonia); 500 (urea).
Do.		do.	Abu Qir C	330 (ammonia); 600 (urea).
Do.		Société El-Nasr d Engrais et d'Industries Chemiques (Government, 100%)	Suez	146 (ammonia); 450 (nitric acid); 365 (ammonia nitrate).
Do.		do.	Talkha	330 (ammonium nitrate); 570 (ammonia and urea).
Do.		Egyptian Chemical Industries (Government, 100%)	Kima	330 (ammonia); 600 (nitric acid); 800 (ammonium nitrate).
Iron ore		Egyptian Iron and Steel Co. (Government, 100%)	El-Gedida Mine, El Bahariya	3,000.
Iron oxide		El-Nasr Mining Co. (Holding Company for Metallurgical Companies, 100%)	Mines near Sinai and Aswan	150.
Natural gas	million cubic meters	Egyptian General Petroleum Corp. (EGPC) (Government, 100%)	Abu Madi	3,800.
Do.	do.	do.	Badreddin-3	3,000.
Do.	do.	do.	Abu Qir/Naf	1,900.
Do.	do.	do.	Ras Shukheir	1,600.
Do.	do.	Grupo Khalda (Repsol S.A., 50%; Apache Oil Co., 40%; Samsung Corp., 10%)	Khalda	24.
Petroleum, crude	million 42-gallon barrels	Gulf of Suez Oil Co. [Egyptian General Petroleum Corp. (EGPC), 50%, and Amoco Corp., 50%]	October, Suez Gulf	45.
Do.	do.	do.	El Morgan, Suez Gulf	27.
Do.	do.	Belayim Petroleum Co. [Egyptian General Petroleum Corp. (EGPC), 50%, and International Egyptian Oil Co. 50%]	Belayim, Suez Gulf	65.
Do.	do.	Suez Oil Company [Egyptian General Petroleum Corp. (EGPC), 50%; Deminex S.A., 25%; Repsol S.A., 25%]	Ras Budran, Suez Gulf	15.

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TABLE 2--Continued
EGYPT: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilites	Annual capacity
Petroleum, pipeline	million 42-gallon barrels	Arab Petroleum Pipeline Co. (Egypt, 50%; Saudi Arabia, 15%; Kuwait, 15%; United Arab Emirates, 15%; Qatar, 5%)	Ain al-Sokhna to Sidi Kir	875.
Petroleum, refined	do.	Cairo Petroleum Refining Co. (Government, 100%)	Mostorod	42.
Do.	do.	do.	Tanta	15.
Do.	do.	Alexandria Petroleum Co. (Government, 100%)	Alexandria	42.
Do.	do.	El-Nasr Petroleum Refining Co. (Government, 100%)	Suez	36.
Do.	do.	Ameriya Petroleum Refining Co. (Government, 100%)	Ameriya	27.
Do.	do.	Suez Petroleum Processing Co. (Government, 100%)	Suez	21.
Do.	do.	Asyut Petroleum Refining Co. (Government, 100%)	Asyut	18.
Phosphate rock		El-Nasr Mining Co. (Holding Company for Metallurgical Companies, 100%)	Mines at East Sabaiya, West Sabaiyaand El Qusier	1,000.
Steel		Ezz El-Dekheila Group (EZDK)	Plants at Ain Sukhna, Alexandria, and Sadat City	1,800 rebar; 1,000 flat steel.
Do.		Egyptian Iron and Steel Co., Hadisolb (Government, 100%)	Helwan steel plant	1,500.

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THE MINERAL INDUSTRY OF EQUATORIAL GUINEA

By Philip M. Mobbs

The Republic of Equatorial Guinea supported an estimated population of about 506,000 in a total area of 28,051 square kilometers on a number of islands and islets, which included Bioko in the Gulf of Guinea, and on the Rio Muni enclave on the African mainland. In 2004, the gross domestic product (GDP) of Equatorial Guinea increased by 34.2% fueled by the increase in international oil prices and the increase in domestic oil, methanol, and natural gas production. The GDP was estimated to be about $4.4 billion at current prices, or $16.7 billion when calculated by purchasing power parity. Hydrocarbons accounted for more than 91% of Government revenue and about 89% of GDP at factor costs (International Monetary Fund, 2005, p. 3, 4, 17; 2005§[1]).

Mineral resources were the property of the State. Natural gas and oil exploration and production contracts were administered by the Ministerio de Minas, Industria y Energia, which also promoted the development of Rio Muni's mineral occurrences. In May, Equatorial Guinea joined the Global Gas Flaring Reduction Public-Private Partnership and agreed to the Global Gas Venting and Flaring Reduction Voluntary Standard.

Offshore oil and natural gas production dominated the country's mineral industry and, in 2004, Equatorial Guinea ranked sixth (based on production volume) of all African crude oil producers. The national oil company, Compañia Nacional de Petróleos de Guinea Ecuatorial (GEPetrol), managed the Government's interest in crude oil production operations and promoted other investment opportunities in the nation's petroleum sector. Most of the produced oil was exported. After liquids were stripped from the Alba Field wet gas stream at Punta Europa, the remaining dry natural gas not used by the methanol plant was re-injected into the gasfield. In addition to liquefied petroleum gases, methanol, oil, and natural gas, some crude construction materials (clay, gravel, sand, and volcanic rock) and gold were produced in Equatorial Guinea (BP p.l.c., 2005, p. 6).

Trade

The increase in international oil prices and the increase in domestic oil production resulted in another jump in the value of Equatorial Guinean petroleum exports to about $4.6 billion in 2004 compared with almost $2 billion in 2002 and $1.1 billion in 2000. Equatorial Guinean petroleum exports to the United States were valued at $974.6 million in 2004 compared with $773.6 million in 2003 and $496 million in 2002. Other significant oil trade partners included, in descending order of value, Spain, China, Canada, and France. Equatorial Guinean chemical exports (primarily methanol) to the United States increased to $180 million in 2004 compared with $136.9 million in 2003 and $71.2 million in 2002 (International Monetary Fund, 2005, p. 24, 30; U.S. International Trade Commission, 2005§).

Commodity Review

In 2004, American oil companies that operated in Equatorial Guinea were investigated by the U.S. Securities and Exchange Commission and, as part of a probe into the alleged money-laundering activity of Riggs Bank of the United States, by the U.S. Senate Committee on Governmental Affairs (Blum, 2004; Minority Staff of the Permanent Subcommittee on Investigations, 2004, p. 99-108).

On the Alba Block, the partnership of Marathon Equatorial Guinea Production Ltd. (a subsidiary of Marathon Oil Corp. of the United States), Samedan of North Africa Inc. (a subsidiary of Noble Energy, Inc. of the United States), and GEPetrol successfully drilled the Gardenia condensate and natural gas prospect. On the adjacent Block D, Marathon (84.6%), SK Corp. of the Republic of Korea (9.4%), and GEPetrol (6%) drilled a condensate and natural gas discovery well on the Corona Prospect.

In 2004, the joint venture of Mobil Equatorial Guinea Inc. (a subsidiary of Exxon Mobil Corp. of the United States), GEPetrol, and Ocean Equatorial Guinea Corp. (a subsidiary of Devon Energy Corp. of the United States) continued the development of Block B with the completion of 14 additional wells in the Zafiro Field.

The partnership of Triton Equatorial Guinea, Inc. (a subsidiary of Amerada Hess Corp. of the United States) (85% working interest) and Energy Africa Equatorial Guinea Ltd. (a subsidiary of Tullow Oil Plc of the United Kingdom) (15%) received Government approval for the development of the Okume complex (originally known as the Northern Block G project) that included the Elon, the Ebano, the Okume, and the Oveng prospects on Block G. GEPetrol had 5% carried interest in the development program. Initial production was scheduled to begin in 2007 at the rate of 40,000 barrels per day of crude oil. In 2004, the partnership also successfully drilled into a crude oil reservoir with the G-19 exploration well.

New production sharing contracts awarded in 2004 included Block I (Atlas Group of Nigeria, 57%; Noble Energy Equatorial Guinea Inc., 38%; and GEPetrol, 5% carried interest) and Block O (Noble, 45%; GEPetrol, 30%; and Glencore Exploration Ltd., 25%).

Outlook

Intensive exploration and international demand for crude oil and natural gas has transformed the Equatorial Guinean region from a marginal deepwater natural gas province to an interesting hydrocarbon prospect. The planned liquefied natural gas plant

[1]References that include a section mark (§) are found in the Internet References Cited section.

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and the production and export of commodities associated with natural gas, such as liquefied petroleum gas and methanol, have provided the impetus to development of the infrastructure necessary to capture natural gas despite the very limited local market, thus significantly reducing the volume of natural gas that would have been flared.

References Cited

Blum, Justin, 2004, U.S. oil firms entwined in Equatorial Guinea deals: The Washington Post, September 7, p. E1, E4.

BP p.l.c., 2005, Statistical review of world energy: London, United Kingdom, BP p.l.c., June, 41 p.

International Monetary Fund, 2005, Republic of Equatorial Guinea—Statistical appendix: Washington, DC, International Monetary Fund Country Report No. 05/151, May, 41 p.

Minority Staff of the Permanent Subcommittee on Investigations, 2004, Money laundering and foreign corruption—Enforcement and effectiveness of the Patriot Act: Washington DC, U.S. Senate Committee on Governmental Affairs, 113 p.

Internet References Cited

International Monetary Fund, 2005 (April), Cyprus, World Economic Outlook Database, accessed May 3, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

U.S. International Trade Commission, 2005, Eq Guinea—U.S. exports, imports, GSP imports, and AGOA imports, by major commodity sectors, annual and year to date Jan-Mar, accessed June 22, 2005, via URL http://reportweb.usitc.gov/africa/by_country.jsp.

Major Source of Information

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Major Publication

Ministerio de Minas y Energia, 2002, Hydrocarbons and mining in Equatorial Guinea: Malabo, Equatorial Guinea, Ministerio de Minas y Energia, 21 p.

TABLE 1
EQUATORIAL GUINEA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand 42-gallon barrels unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
Crude oil and condensate		43,029 [4]	74,855 [4]	90,144 [4]	100,000 [r]	125,000
Gold	kilograms	500	500	500	500	500
Liquefied petroleum gases		800	800	700	800 [r]	875
Methanol	metric tons	--	600,000	719,000	825,000	913,000
Natural gas[5]	million cubic meters	98	790	1,050	1,220	1,390

[r]Revised. -- Zero.
[1]Estimated data are rounded to no more than three significant digits.
[2]Includes data available through June 20, 2005.
[3]In addition to the commodities listed, Equatorial Guinea presumably produced a variety of crude construction materials (clay, gravel, and sand).
[4]Reported.
[5]Produced natural gas not used to produce methanol by Atlantic Methanol Production Co. L.L.C. or as rig or processing plant fuel was reinjected.

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TABLE 2
EQUATORIAL GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(42-gallon barrels unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold	kilograms	Artisanal placer operations	Aconibe, Coro, and Mongomo	500
Liquefied natural gas	metric tons	Equatorial Guinea LNG Holdings Ltd. (Marathon Oil Co., 75%, and Compañia Nacional de Petróleos de Guinea Ecuatorial, 25%)	Punta Europa	3,800,000 [1]
Liquefied petroleum gas		Joint venture of Marathon Oil Co., 52%; Noble Energy Equatorial Guinea Ltd., 28%; Guinea Ecuatorial Oil and Gas Marketing Ltda., 20%	Alba liquefied petroleum gas plant, Punta Europa	875,000
Methanol	metric tons	Atlantic Methanol Production Co. L.L.C. (Marathon Equatorial Guinea Methanol Ltd., 45%; Samedan Methanol Methanol, 45%; Guinea Ecuatorial Oil and Gas Marketing Ltda., 10%	Punta Europa	913,000
Natural gas	million cubic meters	Joint venture of Marathon Oil Co., 63%; Noble Energy Equatorial Guinea Ltd., 34%, Compañia Nacional de Petróleos de Guinea Ecuatorial, 3%	Alba Field, Alba Block	1,390
Oil:				
Crude		Joint venture of Triton Equatorial Guinea, Inc., 80.75%; Energy Africa Equatorial Guinea Ltd., 14.25%; Compañia Nacional de Petróleos de Guinea Ecuatorial, 5%	Ceiba Field, Block G	11,500,000
Do.		Joint venture of Mobil Equatorial Guinea Inc., 71.25%; Ocean Equatorial Guinea Corp., 23,75%; Compañia Nacional de Petróleos de Guinea Ecuatorial, 5%	Zafiro Field, Block B	102,000,000
Crude and condensate		Joint venture of Marathon Oil Co., 63%; Samedan of North Africa Inc., 34%; Compañia Nacional de Petróleos de Guinea Ecuatorial, 3%	Alba Field, Alba Block	16,800,000

[1]Under construction. Expected to open in late 2007.

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The Mineral Industry of Eritrea

By Thomas R. Yager

The East African country of Eritrea, which became independent from Ethiopia in 1993, produced a variety of minerals, rock products, and semimanufactured goods. These included basalt, cement, common clay, coral, gold, granite, gravel, gypsum, kaolin, lime, limestone, marble, pumice, quartz, salt, sand, and silica sand. The country also has deposits of such metals as chromium, copper, iron, lead, magnesium, nickel, silver, and zinc and such industrial minerals as barite, feldspar, and potash (tables 1, 3).

In 2004, Eritrea's gross domestic product (GDP) was about $4.1 billion based on purchasing power parity. The GDP increased by 1.8% in 2004 after rising by 3% in 2003. In 2002, the building and construction and the manufacturing sectors accounted for 9% each of the GDP; electricity and water, 1%; and mining and quarrying, less than 1% (International Monetary Fund, 2003, p. 79; 2005, p. 208; 2005§[1]).

Sub-Sahara Resources NL of Australia held the Adi Nefas, the Adi Rassi, the Debarwa, and the Medrizien exploration licenses near Asmara. In 2004, Sub-Sahara and its joint-venture partner Sunridge Gold Corp. of Canada conducted drilling at the Debarwa copper-gold deposit. The companies also conducted exploration at the Gupo Gold (formerly known as Adi Nefas Doop) deposit in the Adi Nefas License and the Adi Nefas Gossan deposit in the Medrizien License. Sub-Sahara and joint-venture partner Dragon Mining NL of Australia conducted a sampling program at the Zara project in northwestern Eritrea (Sub-Sahara Resources NL, 2004, p. 5-6, 9-11).

Nevsun Resources Ltd. held the Akurdet, the Augaro, the Bisha and the Okreb properties, which are located to the west of Asmara. In 2004, the company spent $5.9 million on exploration at Bisha compared with $5 million in 2003. In October, Nevsun announced that resources of contained zinc amounted to about 1.32 million metric tons; copper, 435,000 metric tons (t); silver, 1,300 t; and gold, 48 t (Nevsun Resources Ltd., 2005a, p. 8; 2005b).

In 2004, Sanu Resources Inc. of Canada explored at its Fanco, Guluj, Hurum, Kerkebet, Kerkebet West, Lokage, and Mogoraib properties in Western Eritrea. The company spent $697,000 on exploration in Eritrea in 2004 (Sanu Resources Ltd., 2004).

In early 2004, Explorations Minières du Nord Ltée. (MDN) acquired a controlling interest in Eritrean Minerals Corp., which held the Harab Suit, the Matite, the Seroa, and the Seroa Hill exploration licenses. MDN started exploration at Harab Suit in June (Explorations Minières du Nord Ltée., 2005, p. 5).

In September 2004, the Government ordered a halt to all exploration activity in Eritrea. The suspension was still in effect at the end of 2004 (Sub-Sahara Resources NL, 2004, p. 4).

Since the closure of the Assab Oil Refinery in 1997, Eritrea's demand for refined petroleum products has been met through imports. Perenco S.A. held an exploration license for the Defnin block in northeastern Eritrea, which covered 13,860 square kilometers in the offshore and onshore. In early 2004, Korea National Oil Corp. and SK Corp. of the Republic of Korea acquired stakes in the Defnin block (Africa Energy Intelligence, 2004b).

In January 2004, Afrex Ltd. and its joint-venture partners Hardman Ltd. and PanContinental Oil & Gas NL of Australia signed a memorandum of understanding with the Government for the Massawa block, which covered one-third of Eritrea's offshore and the Dahlek Islands. In December, the Government declared the agreement to be null and void (Africa Energy Intelligence, 2004a; PanContinental Oil & Gas NL, 2005).

The state-owned Eritrean Electricity Authority (EEA) was responsible for the generation, transmission, and distribution of electricity. After repairs were completed on the Hirgigo plant near Massawa in March 2003, EEA produced more power than the country consumed. In July 2004, the World Bank approved $29 million in loans and $21 million in grants to rehabilitate the power distribution system and to expand rural electrification. About 86% of urban households had access to grid electricity compared with 3% of rural households (World Bank Group, 2004).

Outlook

Eritrea's mineral industry will change little in the short run. Demand for such construction materials as basalt, granite, gravel, limestone, marble, and sand depends upon the strength of the domestic economy. Development of metals deposits depends upon favorable global market conditions, the continuation of peace with Ethiopia, and land-mine clearing. According to predictions by the International Monetary Fund (2005, p. 208), the GDP could increase by 0.7% in 2005 and by 0.1% in 2006.

References Cited

Africa Energy Intelligence, 2004a, East Africa—PanContinental buys Afrex: Africa Energy Intelligence, no. 381, November 17-30, p. 5.

Africa Energy Intelligence, 2004b, Eritrea—South Koreans on the march: Africa Energy Intelligence, no. 364, February 25-March 9, p. 5.

Explorations Minières du Nord Ltée., 2005, Annual report: Montréal, Quebec, Canada, Explorations Minières du Nord Ltée., 35 p.

International Monetary Fund, 2003, Eritrea—Selected issues and statistical appendix: Washington, DC, International Monetary Fund, June 18, 120 p.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Nevsun Resources Ltd., 2005a, Consolidated financial statements—Years ended December 31, 2004 and 2003: Vancouver, British Columbia, Canada, Nevsun Resources Ltd., 15 p.

Nevsun Resources Ltd., 2005b, Management's discussion and analysis—Annual fiscal 2004: Vancouver, British Columbia, Canada, Nevsun Resources Ltd., 7 p.

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

Digitized by Google

PanContinental Oil & Gas NL, 2005, Quarterly activities report—December 2004: Perth, Australia, PanContinental Oil & Gas NL, 2005, 11 p.
Sanu Resources Ltd., 2004, 1st Quarter Report for the period ended September 30, 2004: Vancouver, British Columbia, Canada, Sanu Resources Ltd., 11 p.
Sub-Sahara Resources NL, 2004, 2004 annual report: Perth, Australia, Sub-Sahara Resources NL, 48 p.
World Bank Group, 2004, Eritrea obtains US$50 million for power distribution and rural electrification from the World Bank: Washington, DC, World Bank Group press release, July 8, 1 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Eritrea, World Economic Outlook Database, accessed May 2, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/ 01/data/index.htm.

TABLE 1
ERITREA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
Basalt		122,928	161,759	148,424	111,677 r	499,349
Cement[e]		45,000	45,000	45,000	45,000	45,000
Clays:						
Common		63,427	282,518	225,504	218,539 r	173,412
Kaolin		943	588	250	281 r	101
Coral		74,130	38,596	49,297	70,000 r, e	95,131
Gold	kilograms	264	107	--	9 r	33
Granite		122,017	145,193	150,053	140,418 r	192,803
Gravel		113,769	339,692	220,928	340,125 r	169,254
Gypsum		330	985	504	1,284 r	500
Laterite		2,049	3,575	5,200	832 r	1,240
Lime		40,000 e	42,610	47,406	5,400 r	2,915
Limestone[e, 3]		2,690 [4]	2,800 r	2,900	2,900	2,900
Marble blocks	square meters	1,990	17,656	12,851	1,777,814 r	780,733
Pumice		41	195	212	50 r	439
Quartz		600 e	350	215	370 r	4,496
Salt		47,498	77,853	116,268	5,241 r	3,075
Sand	thousand metric tons	593	685	605	788 r	611
Silica sand		--	--	36	40 e	46

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.
[1]Includes data available through July 26, 2005.
[2]In addition to the commodities listed, feldspar and talc reportedly were produced, but information is inadequate to estimate output.
[3]For other than cement.
[4]Reported figure.

TABLE 2
ERITREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Eritrea Cement Works	Massawa	45,000 cement; 45,000 clinker.
Petroleum products	thousand barrels	Petroleum Corp. of Eritrea[1]	Assab	5,320.

[1]Has not operated since 1997.

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TABLE 3
ERITREA: MINERAL RESOURCES IN 2004

Commodity	Deposit	Tonnage	Grade	Mineral content
Copper and gold[2, 3]	Debarwa:			
	Main and Footwall Zones	1.65 Mt	5.1% Cu, 1.4 g/t Au	84,000 t Cu, 2 t Au.
Do.	Leached Zone	0.47 Mt	7.07 g/t Au	3 t Au.
Gold[3]	Gupo Gold (Adi Nefas Doop)	1.9 Mt	2.99 g/t Au	6 t Au.
Zinc, copper, gold, and silver	Bisha	28.6 Mt	4.63% Zn, 1.52% Cu, 1.68 g/t Au, 45.1 g/t Ag	1.32 Mt Zn, 435,000 t Cu, 48 t Au, 1,300 t Ag.
Do.[3]	Emba Derho	2.59 Mt	2.36% Zn, 0.39% Cu, 0.1 g/t Au, 4.5 g/t Ag	61,000 t Zn, 10,000 t Cu, 12 t Ag.
Zinc, copper, lead, gold, and silver[3]	Adi Nefas Gossan	1.4 Mt	9.3% Zn, 1.4% Cu, 1.6% Pb, 4.28 g/t Au, 160 g/t Ag	130,000 t Zn, 20,000 t Cu, 22,000 t Pb, 6 t Au, 220 t Ag.

[1]Abbreviations used for commodities in this table include the following: Ag--silver; Au--gold; Cu--copper; Pb--lead; Zn--zinc. Abbreviations used for units of measure include the following: g/t--grams per metric ton; Mt--million metric tons; t--metric tons.

[2]Sub-Sahara Resources NL reported that additional resources at Debarwa were 1.3 Mt; grades were not available.

[3]Sub-Sahara indicated that these resource estimates were not in compliance with the standards set by the Australasian Joint Ore Reserves Committee; readers were advised to treat these estimates with caution.

Sources:

Nevsun Resources Ltd., 2005, Annual financial statements—December 31, 2004: Vancouver, British Columbia, Canada, Nevsun Resources Ltd., 15 p.
Sub-Sahara Resources NL, 2002, Annual report 2002: Perth, Australia, Sub-Sahara Resources NL, 49 p.
Sub-Sahara Resources NL, 2004, Annual report 2004: Perth, Australia, Sub-Sahara Resources NL, 48 p.

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THE MINERAL INDUSTRY OF ETHIOPIA

By Thomas R. Yager

Ethiopia has been a producer of gold, silver, and tantalite and such industrial minerals as brick clay, diatomite, feldspar, gemstones, granite, gypsum and anhydrite, kaolin, limestone, pumice, salt, sand, scoria, soda ash, and talc. The country also produced cement, lime, lignite, and steel (table 1). Ethiopia's main mineral export was gold. Other metal deposits include iron ore, manganese, nickel, and platinum. Other industrial mineral deposits include apatite, bentonite, dolomite, potash, quartz, and sulfur.

In 2004, Ethiopia's GDP amounted to about $57.8 billion at purchasing power parity. The GDP grew by 11.6% in 2004 after contracting by 3.9% in 2003. Manufacturing accounted for 5% of the GDP in fiscal year 2002-03; construction, 3%; electricity and water, nearly 2%; and mining and quarrying, nearly 1% (International Monetary Fund, 2005a, p. 56; 2005b, p. 208; 2005§[1]).

Commodity Review

Metals

Columbium (Niobium) and Tantalum.—Ethiopian Mineral Resources Development Enterprise operated the Kenticha open pit columbium (niobium) and tantalum mine near Borena. The company was considering joint ventures with Chinese companies for tantalum exploration (Geda, 2004a). Production of columbite-tantalite amounted to 71 metric tons (t) in 2004 compared with 58 t in 2003 (table 1).

Gold.—The Ethiopian investment company Midroc Gold (a subsidiary of Midroc Ethiopia Group) operated the Lega Dembi gold mine in southern Ethiopia; other gold mines that operated in southern Ethiopia included the Adola and Sakaro. Reported gold production fell to 3,443 kilograms (kg) in 2004 from 3,875 kg in 2003. In fiscal year 2002-03, exports of gold amounted to about 5,000 kg at a value of $42 million, or 9% of total exports (International Monetary Fund, 2005a, p. 77).

Midroc Gold Mine plc acquired prospecting licenses for the Adola/Lega Dembi and Metekel projects. The company planned to explore for gold and rare-earth elements at the Adola/Lega Dembi prospect, which was north of the Lega Dembi Mine, and for gold at Metekel, which was in western Ethiopia (Gebre-Selassie, 2004). Sheba Exploration (UK) plc explored for gold at its Amora Hill project in 2004.

Industrial Minerals

Cement.—Ethiopia had four cement plants with a combined capacity of nearly 1.52 million metric tons per year (Mt/yr) of cement and 1.36 Mt/yr of clinker. In fiscal year 2003-04, Mugher Cement Enterprise produced 980,000 t of cement compared with about 875,000 t in fiscal year 2002-03. Mugher planned an expansion that would double the company's production. The cost of this project was estimated to be $115 million (Africa Monitor, 2004; Alemayehu, 2004).

Salt.—Afar Salt plc, Bashenfer Salt plc, and Geo Action plc produced salt at Afdera Lake in northeastern Ethiopia. The companies indicated that the poor condition of the Sodome Meda-Afdera gravel road raised transport costs and forced them to reduce their production in 2004. Repairs completed on the road in September partially alleviated the problem; the Government planned to complete repairs by the end of fiscal year 2004-05. Higher salt production at Lake Afdera was expected to eliminate Ethiopia's dependence upon salt imports (Taye, 2004).

Ethiopian Mineral Development Share Company (EMDSC) and Ezana Co. were engaged in a joint venture to produce salt at Afdera Lake; the companies planned to produce 85,000 metric tons per year (t/yr) of salt in the first phase of the project and increase production to 250,000 t/yr in the second phase. In 2004, EMDSC took over Ezana's share of the project (Geda, 2004b).

Soda Ash.—Abiyata Soda Ash Enterprise produced 6,444 t of soda ash in 2004 compared with 4,377 t in 2003. The company was conducting a feasibility study on the construction of a new processing plant with a capacity of 1.2 Mt/yr. Subject to favorable results of the study, a first-stage plant with a capacity of 220,000 t/yr would be built (Harriman, 2004).

Mineral Fuels

Petroleum.—At the end of 2004, Ethiopia was totally dependent upon imports to meet its demand for petroleum. In fiscal year 2002-03, the value of imported refined petroleum products and other fuels amounted to $288 million, or about 15% of total imports (International Monetary Fund, 2005a, p. 78). Petronas conducted exploration on Block G in Gambela State and in the Ogaden Basin in 2004.

Infrastructure

The Gilgel Gibe hydroelectric plant was inaugurated in February 2004; the plant had a capacity of 184 megawatts (MW). The Gilgel Gibe II hydroelectric plant was expected to be completed in 2008 at a cost of $464 million. The European Union and Italy would provide most of the funds for the new plant. Gilgel Gibe II would have a capacity of 450 MW. The China Water Resources and Hydropower Construction Group (Sinohydro) planned to complete the 225-MW Tekeze Dam by 2007. In late 2004, Sinohydro requested a one-year extension on the project. The Gilgel Gibe II and Tekeze plants could double Ethiopia's power generating capacity (Africa Energy Intelligence, 2004; Gebre-Selassie, 2004).

[1]References that include a section mark (§) are found in the Internet References Cited section.

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In fiscal year 2003-04, Ethiopia produced 2,311 gigawatthours (GWh) of electricity compared with 2,048 GWh in fiscal year 2002-03. Hydroelectric sources accounted for 98% of the power generated. Most of the country's electricity was produced by the state-owned Ethiopian Electric Power Corp. (National Bank of Ethiopia, 2004§).

At the end of 2003, Ethiopia's transportation network comprised nearly 34,000 km of roads; the Ethiopian segment of the Addis Ababa-Djibouti railroad was 781 km. About 98% of the country's imports and exports were routed through Djibouti (World Bank Group, 2004, p. 1).

Outlook

According to predictions by the International Monetary Fund (2005b, p. 208), the GDP could rise by 5.7% in 2005 and 4.6% in 2006. The outlook for columbium (niobium) and tantalum and gold depend primarily on world market conditions; the outlook for such construction materials as brick clay, cement, limestone, and sand and gravel depend upon the strength of the domestic economy.

References Cited

Africa Energy Intelligence, 2004, Ethiopia—Chinese fail to keep word: Africa Energy Intelligence, no. 382, December 1-14, p. 6.

Africa Monitor, 2004, Mugher secures record high profit: Africa Monitor, August 17, p. B1.

Alemayehu, Hayal, 2004, Mugher reaps own record high profit: Daily Monitor [Addis Ababa, Ethiopia], June 22, 1 p.

Gebre-Selassie, Wondemagegnehu, 2004, Ethiopia, *in* Mining annual review 2004: London, United Kingdom, Mining Journal Ltd. CD-ROM.

Geda, Tamiru, 2004a, China eyes mineral exploration in Ethiopia: Capital Ethiopia, April 27, 1 p.

Geda, Tamiru, 2004b, Ezana loses share in salt industry: Capital Ethiopia, January 6, 1 p.

Harriman, Stephen, 2004, Soda ash, *in* Mining annual review 2004: London, United Kingdom, Mining Journal Ltd. CD-ROM.

International Monetary Fund, 2005a, The Federal Democratic Republic of Ethiopia—Selected issues and statistical appendix: Washington, DC, International Monetary Fund, January 28, 87 p.

International Monetary Fund, 2005b, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Taye, Dawit, 2004, Road for Afdera salt companies: Addis Fortune [Addis Ababa, Ethiopia], December 5, 2 p.

World Bank Group, 2004, Ethiopia—Road sector development Phase II project: Washington, DC, World Bank Group, Report no. 29877-ET, 68 p.

Internet References Cited

International Monetary Fund, 2005 (April), Ethiopia, World Economic Outlook Database, accessed July 15, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

National Bank of Ethiopia, 2004, Energy production—Annual report 2003/2004, accessed July 20, 2005, via URL http://www.nbe.gov.et/NBEPublications/Annualnew_Index.htm.

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TABLE 1

ETHIOPIA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2000	2001[e]	2002[e]	2003[e]	2004[e]
Cement, hydraulic		879,962	900,000 [4]	900,000 [4]	1,200,000	1,300,000
Clays:[5]						
Brick		224,093	200,000 [r]	170,000 [r]	140,000 [r]	106,609 [4]
Kaolin, China clay		1,654	1,800	3,534 [r, 4]	3,088 [r, 4]	4,250 [4]
Other clay	cubic meters	23,000 [e]	25,000	27,000 [r]	28,000 [r]	28,000
Columbium (niobium) and tantalum:						
Columbite-tantalite, ore and concentrate:						
Gross weight	kilograms	64,940	46,900 [r, 4]	55,000 [r, 4]	58,000 [r, 4]	71,000 [4]
Nb content	do.	6,490	4,700 [r]	5,500 [r]	5,800 [r]	7,100
Ta content	do.	38,800	28,000 [r]	33,000 [r]	35,000 [r]	42,000
Diatomite		140 [e]	1,500	1,600 [r]	1,700 [r]	1,700
Feldspar		285	310	340 [r]	350 [r]	461 [4, 5]
Gold, mine output, Au content	kilograms	3,206 [r]	3,862 [r, 4]	3,670 [r, 4]	3,875 [r, 4]	3,443 [4]
Gypsum and anhydrite, crude		46,798	50,500 [r, 4]	22,500 [r, 4]	48,058 [r, 4]	51,200 [4]
Lime		3,769	4,100 [r]	4,500 [r]	4,600 [r]	4,600
Pumice[5]		156,466	180,000 [r]	210,000 [r]	240,000 [r]	270,994 [4]
Salt, rock		56,400	90,000 [r]	120,000 [r]	150,000 [r]	140,000
Scoria[e]		287,000	310,000	340,000 [r]	350,000 [r]	350,000
Silver, mine output, Au content	kilograms	1,018	3,545 [r, 4]	900 [r, 4]	999 [4]	1,133 [4]
Soda ash, natural		3,805	7,543 [4]	3,843 [r, 4]	4,377 [r, 4]	6,444 [4]
Stone, sand and gravel:[6]						
Construction stone, crushed	thousand metric tons	3,459	3,800 [r]	4,100 [r]	4,300 [r]	4,300
Dolomite		NA	NA	NA	NA	1,248 [4]
Granite		140	150	170 [r]	170 [r]	170
Limestone	thousand metric tons	1,197	1,100 [r]	1,100 [r]	1,000 [r]	915 [4]
Marble		6,662	7,200	7,900	8,100	8,100
Sand[7]	thousand metric tons	1,853	2,000	2,200 [r]	2,300 [r]	2,300
Sandstone	do.	NA	NA	NA	NA	1,221 [4]
Silica sand		5,601	6,000	6,000	6,000	6,000
Other stone		15,768	17,000	19,000 [r]	19,000 [r]	19,000

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. NA Not available.

[1]Includes data available through October 31, 2005.

[2]Data are for year ending July 7 of the year listed.

[3]In addition to the commodities listed, some lignite, semiprecious gemstones, crude and semimanfactured steel, sulfuric acid, and talc reportedly were produced, and platinum was reportedly contained in gold ingots from the Lega Dembi Mine, but information is inadequate to estimate output.

[4]Reported figure.

[5]Includes quartz.

[6]When reported as volume or pieces, conversions to metric tons are estimated.

[7]May include gravel.

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TABLE 2
ETHIOPIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Caustic soda		Abiyata Soda Ash Enterprise (Government-owned)	Plant at Ziway	10,000.
Cement		Messebo Building Materials Production Share Co. (Government-owned)	Plant at Mekele	640,000 cement; 600,000 clinker.
Do.		Mugher Cement Enterprise (Government-owned)	Plant at Mugher	720,000 cement; 620,000 clinker.
Do.		do.	Plant at Addis Ababa	125,000 cement; 112,000 clinker.
Do.		do.	Plant at Dire Dawa	32,000 cement; 24,000 clinker.
Columbium (niobium) and tantalum	kilograms	Ethiopian Mineral Resources Development Enterprise (Government-owned)	Kenticha Mine near Borena	112,000 tantalum.[e]
Glass		Addis Ababa Bottle and Glass Share Company	Plant at Addis Ababa	8,000.
Gold		Midroc Gold (subsidiary of Midroc Ethiopia Group)	Mine at Lega Dembi	1,500,000 ore processing.
Do.	kilograms	do.	do.	4,000 gold.
Kaolin		Ethiopian Mineral Resources Development Enterprise	Mine at Bamba Wuha	15,000.
Marble		Ethiopian Marble Industries	Mines at Harar and various sites in western Ethiopia	NA.
Do.		National Mining Corp. (subsidiary of Midroc Ethiopia Ltd.)	Mine at Mugher	NA.
Do.		Saba Stones	Mine in Tigre Province	NA.
Salt		Afar Salt plc, Bashenfer Salt plc, and Geo Action plc	Mines at Afdera Lake	NA.
Soda ash		Abiyata Soda Ash Enterprise	Mine at Lake Abiyata	20,000.[e]
Steel:				
Crude		Ethiopia Iron and Steel Factory	Plant at Akaki	NA.
Semimanufactured		do.	do.	12,000.
Do.		Zuquala Steel Rolling Mill Enterprise (Government-owned)	Plant at Debre Zeit	100,000.
Galvanized		Akaki Metal Products Factory	Plant at Akaki	NA.
Sulfuric acid		Melkasa Aluminum Sulfate and Sulfuric Acid Factory	Plant at Melkasa	NA.

[e]Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

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TABLE 3

ETHIOPIA: MINERAL RESOURCES IN 2004[1]

Commodity	Deposit	Tonnage	Grade	Mineral content
Diatomite	Lakes Region, Shewa and Arsi Provinces	NA	NA	85 Mt.
Dolomite	Galleti	NA	NA	1.4 Mt.
Do.	Hula-Kuni	NA	NA	250,000 t.
Feldspar	Kenticha	1.14 Mt	40% feldspar	500,000 t.
Do.	Babile-Bombas	0.3 Mt	50% feldspar	150,000 t.
Gold	Lega Dembi	NA	NA	83,000 kg.
Do.	Adola	NA	NA	4,500 kg.
Gypsum	Sodoble	NA	NA	56 Mt.
Do.	Adigudom	NA	NA	400,000 t.
Kaolin	Bombowha	1 Mt	30% kaolin	300,000 t.
Do.	Kombelcha	0.96 Mt	31% kaolin	300,000 t.
Limestone	Mossobo	NA	NA	69.5 Mt.
Do.	Mugher	NA	NA	50 Mt.
Do.	Dire Dawa	NA	NA	46 Mt.
Marble	Mora	NA	NA	46.5 Mt.
Do.	Baruda	NA	NA	13.6 Mt.
Natural gas	Calub	25 billion cubic meters	NA	NA.
Peridot	Bulgendo	NA	NA	2,457 kg.
Salt	Denkali depression	NA	NA	3,000 Mt.
Do.	Lake Afdera	NA	NA	290 Mt.
Silica sand	Mugher	NA	NA	3.4 Mt.
Soda ash	Lakes Abiyata, Chiltu, and Shala	NA	1.1% to 1.9% Na_2CO_3	460 Mt.
Talc	Anno	NA	NA	120,000 t.

NA Not available.

[1]Abbreviations used for commodities in this table include the following: Na2CO3, sodium carbonate (soda ash). Abbreviations used for units of measure include the following: kg--kilograms; Mt--million metric tons; and t--metric tons.

Sources: Mengistu, Tibetu, and Fentaw, H.M., 2000, The industrial mineral and rock resource potential of Ethiopia: Chronicle of Mineral Research & Exploration, no. 540, September, p. 33-40; Radler, Marilyn, 2002, Worldwide reserves increase as production holds steady: Oil & Gas Journal, v. 100, no. 52, December 23, p. 113-145; Ethiopia Ministry of Mines, 2002, Opportunities for investment in Ethiopia's industrial minerals: Addis Ababa, Ethiopia, Ethiopia Ministry of Mines, 19 p.; Ethiopia Ministry of Mines, 2002, Opportunities for investment in Ethiopia's gemstones: Addis Ababa, Ethiopia, Ethiopia Ministry of Mines, 8 p.; Mining Journal, 2002, Ethiopia supplement: Mining Journal, v. 338, no. 8689, June 14, 12 p.

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The Mineral Industry of Gabon

By Omayra Bermúdez-Lugo

The equatorial African republic of Gabon is located on the Atlantic Ocean coast between Congo (Brazzaville) to the south and Cameroon and Equatorial Guinea to the north. The country's estimated 1.35 million inhabitants share a total land area of about 258,000 square kilometers (km^2) (U.S. Central Intelligence Agency, 2005§[1]). Gabon's mineral industry was dominated by crude petroleum and manganese production. Crude petroleum accounted for about 45% of the country's gross domestic product (GDP), 80% of its exports, and more than 50% of Government revenues; petroleum production, however, has been on a declining trend since 1997 (International Monetary Fund, 2005§). According to the U.S. Energy Information Administration (2004§), Gabon's proven petroleum reserves were estimated to be 2.5 billion barrels. At a current extraction rate of about 87 million barrels per year (table 1), reserves could last for another 25 to 30 years. Government efforts to attract new foreign investors by increasing the number of production-sharing agreements and exploration permits available have not been successful in recent years; new discoveries by petroleum companies operating in the country during 2004, however, could reverse this trend.

Gabon ranks among the world's five leading producers of manganese (Corathers, 2005). Other nonfuel mineral commodities produced in the country included cement, diamond, and gold. Other identified resources were columbium (niobium) and tantalum, iron ore, and phosphate. In 2004, the country's GDP based on purchasing power parity was estimated to be $9.2 billion (International Monetary Fund, 2005§).

Government Policy and Legislation

The Ministry of Mines, Energy, and Petroleum [Ministère des Mines, de l'Energie et du Petrole] is responsible for the administration of the minerals sector in Gabon. A new Mining Code was enacted in July 2000. Under the new Code, mining rights include a fixed fee, a surface occupation fee, and a value-added tax that varies between 0.5% and 5% per year. Fiscal charges vary according to the permit type and the stage of the operation. The corporate tax rate is 35% (MBendi, 2004d§).

Commodity Review

Metals

Columbium (Niobium) and Tantalum.—Cluff Mining plc of the United Kingdom held the rights to the Mabounié phosphate and niobium-bearing carbonatite deposit in central Gabon. The mineral resource at Mabounié was estimated to be 16.72 million metric tons (Mt) of carbonatite ore at a grade of 1.75% niobium pentoxide (Nb_2O_5) that contains 292,600 metric tons (t) of niobium oxide (Coakley, 2004). No additional work was reported at Mabounié in 2004.

Gold.—In 2003, SearchGold Resources Inc. of Canada through its 90% owned subsidiary Ressources Golden Gram Gabon, S.A.R.L. conducted a scoping study to evaluate the possibility of developing an open pit mine at Bakoudou in southeastern Gabon. Preliminary measured and indicated oxide resources at Bakoudou were estimated to be 2.1 Mt at a grade of 2.45 grams per metric ton (g/t) gold, and 570,000 t of measured and indicated sulfide ore at a grade of 6.11 g/t gold. In 2004, the company was completing an in-fill drilling program to enable a final evaluation of the project. The study was expected to be completed by May 2005 (SearchGold Resources Inc., 2005, p. 3).

Iron Ore.—Representatives from the China Metallurgical Equipment Importation and Exportation Company (CMIEC) visited Gabon in late December 2004 to conduct preliminary studies (not described) at the Belinga iron ore deposit in northwestern Gabon. The envisioned iron ore project was to include the construction of railway lines that would link Belinga-Booue and Ntoum-Santa Clara to the Transgabonais railway, the construction of a deepwater port at Santa Clara, and the building of a hydroelectric dam on the Invindo River (Africa Mining Intelligence, 2005; MBendi, 2004b§).

Manganese.—Manganese ore was produced at the Moanda Mine in Franceville and shipped 600 kilometers (km) via the Transgabonais railway to the Owenda minerals port in Libreville. A track upgrade performed during 2003 to increase train frequency was completed in 2004. As a result, manganese ore production at Moanda, including sinter, increased to 2.46 Mt from 1.95 Mt in 2003 (Eramet Group, 2004§). Compagnie Miniere de l'Ogooue S.A. (Comilog), which was a 67% owned subsidiary of Eramet Group of France owned the Moanda mine. Most of the sinter produced at Moanda was shipped to a smelter in France, which was operated by Société du Ferromanganèse de Paris-Outreau (SFPO) (a subsidiary of Eramet Group). Comilog planned to increase production capacity to 3 million metric tons per year (Mt/yr) by 2006 (Eramet Group, 2005, p. 3; MBendi, 2004c§).

Companhia Vale do Rio Doce (CVRD) of Brazil through its subsidiary Compagnie Minière Trois Rivières explored for manganese in the Franceville and Okondjá regions of southeastern Gabon. CVRD planned to invest $5 million in exploration during 2004; to conduct an economic feasibility study for mining operations; and to construct a branch railway that will connect the Okondjá region to the Transgabonais railway, an export terminal at the Owenda port, and a hydroelectric plant (Mining Review Africa, 2004, p. 28).

Platinum-Group Metals.—In 2003, SouthernEra was granted an exclusive exploration permit for the Monts de Cristal project to explore for platinum-group metals. Monts de Cristal was located about 65 km east of Libreville. In 2004, the company announced that a preliminary assessment of stream samples collected at Monts de Cristal yielded positive results.

[1]References that include a section mark (§) are found in the Internet References Cited section.

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SouthernEra planned to complete reconnaissance sampling at the property and to assess the nickel and copper potential of the complex during the year. Future work included the design of a followup program once all reconnaissance results are interpreted, including grid mapping and geophysical surveys, soil grid sampling, drilling, and geologic modeling. SouthernEra's permit was valid for 3 years and covered a 9,409 km^2 area (SouthernEra Resources Ltd., 2004d).

Industrial Minerals

Diamond.—SouthernEra Resources Ltd. (SouthernEra) of Canada held four exclusive diamond exploration permits in Gabon. In October 2004, the company announced the discovery of eight meta-kimberlite bodies at its Makongonio exploration project in southern Gabon. In November, the company announced the discovery of five additional meta-kimberlite intersections at Makongonio. In December, the company announced the recovery of microdiamonds from the two 200-kilogram (kg) samples that it had sent to Canada for analysis. The microdiamond analysis was conducted by SGS Lakefield Research Limited. The Makongonio project, which comprised an area of 1,837 km^2, was a joint venture between SouthernEra (60%) and the Gabonese mining companies Cogemat Inc. (32.5%) and Geoscan (7.5%). Future work at Makongonio included diamond core-drilling, ground geophysics, pitting, stream and soil sampling, and trenching (SouthernEra Resources Ltd., 2004a-c). In addition to the Makongonio project, SouthernEra held 100% interest in the Kango and Sud projects and 95% interest in the M'bigou project (SouthernEra Resources Ltd., 2004a).

Artisanal miners produced small quantities of diamond in the Mitzic region in northern Gabon. DeBeers had conducted aeromagnetic, alluvial, and geochemical surveys in the area during the past 5 years (Mining Annual Review, 2004; MBendi, 2004a§).

Mineral Fuels

Petroleum.—According to the U.S. Energy Information Administration (2004§), Gabon, whose proven oil reserves were estimated to be 2.5 billion barrels in 2004, was the third leading oil producer in Sub-Saharan Africa. In early 2004, China's President, Hu Jintao, visited Gabon for the purpose of securing a steady supply of Gabonese petroleum. Following the President's visit, the two countries signed an agreement on economic and technological cooperation, which included the supply of 20,000 barrels per day (bbl/d) of Gabonese crude petroleum to China. In addition, China's Government-owned China Petroleum and Chemical Corporation (Sinopec) was examining the possibility of conducting onshore and offshore exploration in Gabon in partnership with Total Gabon S.A. [a joint venture between the Government of Gabon and Total S.A. of France (formerly TotalFinaElf)], and of building an oil refinery in the country (ANN News, 2004§; Embassy of the People's Republic of China in Ireland, 2004§; Energy Security, 2004§; People's Daily Online, 2004§).

Shell Gabon S.A. (50%) and its partner PanOcean Energy Corporation Ltd. (PanOcean) of Canada (50%) announced the discovery of petroleum in the two wells drilled during 2004. The first discovery was made in September at the Awokou-1 well located within the Koula prospect, and the second discovery was made in October at the Awodam-001 well located within the Damier prospect. Both prospects were part of the company's Awoun concession, which is located about 8 km north of the producing Avocette field. The partners planned to conduct additional evaluation and development of the prospects during 2005 (Royal Dutch/Shell Group, 2004; Alexander's Gas & Oil Connections, 2004§).

In 2004, the joint-venture partners PanAfrican Energy Gabon (a subsidiary of PanOcean) (31.36%), VAALCO Gabon Etame Inc. (VAALCO) (a subsidiary of VAALCO Energy Inc. of United States) (28.07%), Sasol Petroleum West Africa Limited (27.75%), Energy Africa Gabon S.A. (a subsidiary of Tullow Oil plc of the United Kingdom) (7.5%), Energy Resources Japan Etame (Gabon) Limited (2.98%), and PetroEnergy Resources Corp. (2.34%) announced two new oilfield discoveries at the VAALCO-operated Etame Block. The first discovery was made in January at the Ebouri No. 1 well offshore Gabon about 11 km northwest of the Etame oilfield, which produces an average of 15,000 bbl/d. The second discovery was made in June 2004 at the Avouma prospect. Drill-stem tests conducted at Avouma yielded an oil flow rate of 6,600 bbl/d. The Avouma oilfield is located about 20 km southeast of the Etame oilfield. In October 2004, the partners announced the completion of an additional production well (Etame 5-H), which increased gross petroleum production from 15,000 bbl/d to 20,000 bbl/d. The full development of the new discoveries was estimated to cost about $100 million. Among the plans for 2005 were the appraisal and development of the Avouma and Ebouri discoveries, the drilling of two additional exploration wells at Ebouri, and engineering studies to optimize production from the Etame oilfield (Sasol Ltd. 2004a, b; 2005, p. 39; PanOcean Energy Corporation Ltd., 2005, p. 8).

The Sogara oil refinery, which is located to the south of Libreville in the town of Port Gentil, was Gabon's only refinery. In 2004, the refinery operated at about 82% of its 21,000 bbl/d nameplate capacity (U.S. Energy Information Administration, 2004§).

Uranium.—Reclamation work at the Mounana uranium mine was completed in July 2004. The mine, which had been in operation for nearly 40 years, closed in 1999 following the depletion of ore reserves (Antenna, 2004§).

Outlook

Gabon's economy is likely to be dominated by the petroleum sector in the near future following a successful 2004 petroleum exploration program, which included several new petroleum discoveries, and increased production at existing oilfields. Growth in the sector will depend, however, on the successful development of these discoveries and on ongoing onshore and offshore exploration activities. Manganese ore production, which is expected to increase by 50% in 2006, will continue to be an important component of the minerals sector.

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References Cited

Africa Mining Intelligence, 2005, Key Chinese investments: Africa Mining Intelligence, no. 100, January 12-15, p. 1.

Coakley, G.J., 2004, The mineral industry of Gabon, *in* Area reports—International—Africa and the Middle East: U.S. Geological Survey Minerals Yearbook 2002, v. III, p. 14.1-14.3.

Corathers, L.A., 2005, Manganese: U.S. Geological Survey Mineral Commodity Summaries 2005, p. 104-105.

Eramet Group, 2005, 2004 annual results: Paris, France, Eramet Group press release, March 10, 7 p.

Mining Annual Review, 2004, Gabon, *in* Mining Annual Review, CD-ROM.

Mining Review Africa, 2004, Brazilian mining giant looks to Africa: Mining Review Africa, no. 5, p. 26-29.

PanOcean Energy Corporation Ltd., 2005, 2004 annual report: St. Helier, Jersey, Channel Islands, PanOcean Energy Corporation Ltd., 69 p.

Royal Dutch/Shell Group, 2004, Shell discovers oil in its Awoun permit Gabon, West Africa: The Hague, The Netherlands, Royal Dutch/Shell Group press release, October 4, 1 p.

Sasol Ltd., 2004a, Sasol increases offshore oil production in southern Gabon and discovers two new oilfields: Johannesburg, South Africa, Sasol Ltd. press release, October 5, 1 p.

Sasol Ltd., 2004b, Sasol strikes more oil offshore southern Gabon: Johannesburg, South Africa, Sasol Ltd. press release, February 4, 1 p.

Sasol Ltd. 2005, 2004 annual report: Johannesburg, South Africa, Sasol Ltd., 125 p.

SearchGold Resources Inc., 2005, 2004 annual report: Montreal, Quebec, Canada, SearchGold Resources Inc., 31 p.

SouthernEra Resources Ltd., 2004a, SouthernEra discovers meta-kimberlite pipe within the Makongonio alluvial diamond field in Gabon, West Africa: Toronto, Ontario, Canada, SouthernEra Resources Ltd. press release, October 6, 3 p.

SouthernEra Resources Ltd., 2004b, SouthernEra discovers new kimberlitic bodies in Gabon, West Africa: Toronto, Ontario, Canada, SouthernEra Resources Ltd. press release, November 10, 4 p.

SouthernEra Resources Ltd., 2004c, SoutherEra recovers the first diamonds from the Makongonio diamond project in Gabon, West Africa: Toronto, Ontario, Canada, SouthernEra Resources Ltd. press release, December 2, 3 p.

SouthernEra Resources Ltd., 2004d, SoutherEra's Monts de Cristal PGM/nickel/copper project in Gabon returns encouraging PGM and nickel results: Toronto, Ontario, Canada, SouthernEra Resources Ltd. press release, June 22, 4 p.

Internet References Cited

Alexander's Gas & Oil Connections, 2004, Shell and PanOcean discover second oil accumulation in Gabon, accessed November 29, 2004, at URL http://www.gasandoil.com/goc/discover/dix44705.htm.

ANN News, 2004, Gabon: Oil pact with China aims to boost falling reserves, accessed April 12, 2005, at URL http://www.africahome.com/annews/categories/gabon/EpZypkyZEEcXjpMFrG.shtml.

Antenna, 2004, The inglorious legacy of COGEMA in Gabon, decommissioning of the Mounana uranium mine and mill site, accessed April 8, 2005, at URL http://www.antenna.nl/wise/uranium/udmoun.html.

Embassy of the People's Republic of China in Ireland, 2004, Hu Jintao talks with President Omar Bongo of Gabon, accessed April 12, 2005, at URL http://www.chinaembassy.ie/eng/NewsPress/t156737.htm.

Energy Security, 2004, Chinese quest for crude increases focus on Africa, accessed April 12, 2005, at URL http://www.iags.org/n1115044.htm.

Eramet Group, 2004, Manganese profile, accessed April 8, 2005, at URL http://www.eramet.fr/us/manganese/hp_manganese.php.

International Monetary Fund, 2005, Gabon, World Economic Outlook Database, accessed April 14, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

MBendi, 2004a, Gabon diamond mining overview, accessed April 13, 2005, at URL http://www.mbendi.co.za/indy/ming/dmnd/af/ga/p0005.htm.

MBendi, 2004b, Gabon iron ore mining overview, accessed April 13, 2005, at URL http://www.mbendi.co.za/indy/ming/iron/af/ga/p0005.htm.

MBendi, 2004c, Gabon manganese mining overview, accessed April 13, 2005, at URL http://www.mbendi.co.za/indy/ming/mang/af/ga/p0005.htm.

MBendi, 2004d, Gabon mining overview, accessed April 13, 2005, at URL http://www.mbendi.co.za/indy/ming/af/ga/p0005.htm.

People's Daily Online, 2004, Hu stresses enhancing China-Gabon ties, accessed April 12, 2005, at URL http://english.people.com.cn/200409/09_156364.html.

U.S. Central Intelligence Agency, 2005 (February 10), Gabon, World Factbook 2004, accessed March 31, 2005, at URL http://www.cia.gov/cia/publications/factbook/geos/gb.html.

U.S. Energy Information Administration, 2004 (November), Gabon, Country Analysis Briefs, accessed November 4, 2004, at URL http://www.eia.doe.gov/emeu/cabs/gabon.html.

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TABLE 1
GABON: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2000	2001	2002	2003	2004[e]
Cement:						
Clinker[e]	metric tons	210,000 [3]	300,000	350,000	350,000	350,000
Hydraulic[e, 4]	do.	210,000	210,000	210,000	350,000	350,000
Diamond, gem and industrial[e]	carats	500	500	500	500	500
Gold, mine output, Au content[e, 5]	kilograms	70	70	70	70	70
Manganese:						
Metallurgical-grade ore, gross weight (50% to 53% Mn)	thousand metric tons	1,706	1,758	1,816	1,950 [e]	2,400
Pellets, battery- and chemical-grade, gross weight (82% to 85% MnO_2)	do.	37	33	40	50 [e]	60
Total	do.	1,743	1,791	1,856	2,000	2,460 [3]
Natural gas, gross[e]	million cubic meters	99	99	80	79	80
Petroleum:						
Crude	thousand 42-gallon barrels	118,625	98,550	91,980	87,965 [r]	87,235 [3]
Refinery products	do.	4,354	6,672	6,500	6,500 [e]	6,300

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised.
[1]Table includes data available through April 2005.
[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) is also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]Includes cement produced from imported clinker.
[5]Gold production figures do not include production smuggled out of the country which, in recent years, was estimated to exceed 400 kilograms per year.

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THE MINERAL INDUSTRIES OF THE GAMBIA, GUINEA-BISSAU, AND SENEGAL

By Omayra Bermúdez-Lugo

In 2004, mineral production in The Gambia and Senegal was limited to the production of basalt, cement, clay, gold, laterites, limestone, natural gas, petroleum refinery products, salt, sand, silica sand, and zircon. Mineral production in Guinea-Bissau was limited to small-scale production of construction materials, such as clay, granite, limestone, and sand, but information was inadequate to make reliable estimates of output levels. More-extensive coverage of the mineral industries of The Gambia, Guinea-Bissau, and Senegal can be found in the 2002 and 2003 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East.

TABLE 1
THE GAMBIA AND SENEGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Country and commodity		2000	2001	2002	2003	2004[e]
THE GAMBIA[2]						
Clay[3]	metric tons	1,960	2,000 [e]	11,814 [4]	12,375 [4]	12,400
Laterites[3]		NA	NA	410	227 [4]	230
Silica sand[3]		170	170 [e]	1,508 [4]	1,534 [4]	1,530
Zircon		--	--	--	13 [4, 5]	13
SENEGAL[6]						
Basalt[3]		NA	NA	116	363 [7]	360
Cement, hydraulic		1,341	1,539	1,653 [r]	1,694 [r]	1,700
Clay[3]		NA	NA	19	21 [7]	20
Clays, Fuller's earth (attapulgite)		149	121	138 [r]	195 [r]	200
Gold[e, 8]	kilograms	550	550	600 [9]	600 [7, 9]	600
Laterites[3]		NA	NA	112	304 [7]	300
Limestone[3]		NA	NA	1,461	1,588 [7]	1,600
Natural gas[e]	thousand cubic meters	56,000	56,000	3,368 [9]	12,638 [7, 9]	12,600
Petroleum:[e]						
Crude oil	thousand 42-gallon barrels	1	1	--	--	--
Refinery products	do.	6,000	6,424 [9]	6,400	6,400	6,400
Phosphate rock and related products:						
Calcium phosphate-based fertilizers		155	203	201	251	210 [9]
Crude rock:						
Aluminum phosphate		--	34	4	4 [7]	4
Calcium phosphate		1,845 [r]	1,708	1,547 [r]	1,761 [r, 7]	1,800 [p]
Phosphoric acid		295	359	581	511	569 [9]
Salt		124	110	172 [r]	235 [r]	240
Sand[3]		NA	NA	860	2,168 [7]	2,170

[e]Estimated; estimated data are rounded to no more than three significant digits. [p]Preliminary. [r]Revised. NA Not available. -- Zero.

[1]Table includes data available through August 22, 2005.

[2]In addition to the commodities listed, The Gambia also produced a variety of construction materials (laterite, sand, and shell), but information is inadequate to make reliable estimates of output levels.

[3]Values converted from cubic meters to metric tons. Specific gravity, in grams per cubic meter—basalt, 2.8; clay, 2.55; laterites, 2.55; limestone, 2.6; and sand, 2.6.

[4]Source: Geology Department of the Republic of The Gambia.

[5]From sales.

[6]In addition to the commodities listed, Senegal also produced sand and gravel, and stone for local construction purposes, but information is inadequate to make reliable estimates of output levels.

[7]Source: Direction des Mines et de la Geologie, Republique du Senegal.

[8]Government estimate of unreported production of artisanal gold.

[9]Reported figure.

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TABLE 2
SENEGAL: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Attapulgite	Senegal Mines (Government, 49%, and private, 51%)	240 km south of Dakar	110
Do.	Société Senegalaise de Phosphates de Thies SA (private, 100%)	Lam Lam	NA
Cement	Les Ciments du Sahek S.A. of Senegal (private, 100%)	Kirène plant	600
Do.	Société Ouest Africaine des Ciments (private, 100%)	Rufisque plant	1,600
Petroleum products	Total (54%), Shell (23%), Mobil (13%) Government (10%)	Dakar refinery	1,226
Phosphate rock	Compagnie Senegalaise des Phosphates de Taiba (Government, 70%, and private, 30%)	Taiba Mine	2,000
Do.	Société Senegalaise de Phosphates de Thies SA (private, 100%)	Lam Lam, Sebikhotane, and Allou-Kagne	NA
Phosphoric acid	Compagnie Senegalaise des Phosphates de Taiba (Government, 70%, and private, 30%)	Darou Khoudoss	660

NA Not available.

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The Mineral Industry of Ghana

By Omayra Bermúdez-Lugo

The Republic of Ghana, which is located in western Africa, is bordered on the south by the Gulf of Guinea, on the north by Burkina Faso, on the west by Côte d'Ivoire, and on the east by Togo. The country's 21.1 million inhabitants shared an area of about 238,500 square kilometers (km2) (World Bank Group, The, 2005§1). In 2004, the real gross domestic product (GDP) growth was estimated to be 5.8% and was projected to increase to 5.9% in 2005 (Organisation for Economic Co-operation and Development, 2005, p. 254). The GDP based on purchasing power parity was estimated to be about $50.4 billion in 2004; the per capita GDP based on purchasing power parity was estimated to be about $2,475 for the same period (International Monetary Fund, 2005§, p. 5). Ghana's economy was primarily agricultural. The World Bank, through the International Finance Corporation (2006§), estimated that mining accounted for about 5% of the country's GDP, 30% of exports, and 3% to 4% of Government fiscal revenues and that gold production accounted for about 95% of total mining export proceeds. Mineral commodities produced in the country were aluminum, bauxite, diamond, gold, manganese, natural gas, petroleum, salt, and silver.

Government Policy and Legislation

The overall legislative framework for the mining sector in Ghana is provided by the Minerals and Mining Law of 1986, as amended by the Minerals and Mining (Amendment) Act of 1994; the Minerals Commission Law of 1986; and the Small-Scale Gold Mining Law of 1989. Under the Minerals and Mining Law, mining companies must pay royalties of no less than 3% of their gross revenues and, depending upon their profitability rate, up to 12%; companies may also pay corporate taxes at standard rates. Companies are exempt from custom duties on accessories, equipment, machinery, and plants used for mining operations, but must pay local property taxes on their immovable properties. In 2004, the Government launched the Extractive Industries Transparency Initiative, which was aimed at ensuring transparency among mining companies conducting operations in the country (International Monetary Fund, 2004, p. 29-32; Republic of Ghana, 2004§). The Ministry of Mines and Energy oversees all aspects of Ghana's minerals sector and is the entity responsible for granting mining and exploration licenses. Ghana National Petroleum Corp. (GNPC) was the Government entity responsible for petroleum exploration and production.

The Government continued to pursue public sector reforms. As part of the reforms, it converted a portion of the Tema Oil Refinery (TOR) debt into TOR bonds and put in place an automatic adjustment formula for petroleum prices. An independent National Petroleum Board was given the authority to adjust petroleum prices. As a Government-owned enterprise, TOR had not been allowed in the past to charge competitive prices for its petroleum products (Organisation for Economic Co-operation and Development, 2005, p. 262).

The European Union, under the Mining Sector Support Program, was to invest about $25 million to help Ghana's Geological Survey conduct airborne geophysical surveys and mapping. The program was aimed at identifying mineral resources other than gold within the country (Africa Mining Intelligence, 2004b; allAfrica.com, 2004a§).

Environmental Issues

The Ghanian Environmental Protection Agency, which was established in 1994 through Act 490, is the Government entity responsible for the formulation of policies on all aspects of the environment. The agency's functions include making recommendations to the Government for the protection of the environment; coordinating the activities of bodies concerned with the technical aspects of the environment for the purpose of controlling the generation, treatment, storage, transportation, and disposal of industrial waste; securing the control and prevention of discharge waste into the environment; protecting and improving the quality of the environment; collaborating with foreign and international agencies as necessary; issuing environmental permits and pollution abatement notices; prescribing standards and guidelines related to the pollution of air, water, and land; ensuring compliance with environmental impact assessment procedures; acting in liaison and cooperating with other Government agencies; and conducting investigations into environmental issues among several other functions (Environmental Protection Agency, 2006, p. 3-4).

Ghana's Obuasi region is known to host arsenopyritic gold-bearing ore bodies. According to company reports, during the 1990s, an arsenic precipitation plant was installed at the Pompora Treatment Plant for the commercial recovery of arsenic from the roaster flue gases. At the time, the recovered arsenic trioxide was sold to Europe for commercial applications. As the market for arsenic declined, the treatment plant was shut down in 2000 and about 10,000 metric tons (t) of arsenic was stockpiled in bags at Obuasi. After the introduction of the Biox treatment process, the arsenic trioxide was converted to arsenic pentoxide and deposited in tailings dams. AngloGold Ashanti Ltd. (the company that was formed through the merger of Ashanti Goldfields Ltd. and AngloGold Ltd.) reported that inadequate storage of the stockpiled bags allegedly caused arsenic contamination to the Pompora stream. The problem was identified during the company's due diligence study prior to the merger. AngloGold Ashanti constructed a lined storage dam at the old heap leach site. The company planned to move the arsenic to a new facility where it will be stored and gradually disposed of by blending it into the Biox process circuit where it

[1]References that include a section mark (§) are found in the Internet References Cited section.

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will be chemically stabilized and deposited as a component of the tailings residue in the new Sansu Tailings Storage Facility. The company estimates that it will take about 6 years to dispose of the arsenic (AngloGold Ashanti Ltd., 2005§).

Trade

According to the U.S. Census Bureau, Ghana's exports to the United States were valued at about $145 million in 2004 compared with about $82 million in 2003; $47.8 million of these exports was from petroleum products; $18.3 million, crude petroleum; $3.34 million, aluminum and bauxite; and $163,000, gem-quality diamond (U.S. Census Bureau, 2005b§). Imports from the United States were valued at about $310 million in 2004 compared with about $209 million in 2003. These included nearly $24 million for excavating machinery; $9.9 million for petroleum; $2.2 million for drilling and oilfield equipment; and $539,000 for petroleum products (U.S. Census Bureau, 2005a§).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—The Government of Ghana acquired Kaiser Aluminum Corp.'s 90% interest in Volta Aluminum Company Ltd. (Valco) in 2004. Alcoa Inc. of the United States held the remaining 10% interest in Valco. The Government planned to sell some of its acquired equity interest in the company to an interested partner and to create an integrated aluminum industry that could supply bauxite to the 200,000-metric-ton-per-year (t/yr) Valco smelter, which is located in Tema. Kaiser had closed the Valco plant in 2003 after struggling with fluctuating operating levels for several years and dealing with restricted power allocations from the Volta River Authority (Coakley, 2003, p. 17.2; Kaiser Aluminum Corp., 2004; Mining Journal, 2004; Mining Review Africa, 2004).

BHP Billiton p.l.c. applied for a prospecting license to explore the Kibi and the Nyinahin bauxite deposits in the Ashanti and eastern regions. Granting of the licenses was contingent upon BHP conducting an environmental impact study of the areas; the study must be approved by Ghana's Environmental Protection Agency (Africa Mining Intelligence, 2004a)

Gold.—AngloGold Ashanti operated the Bibiani open pit mine; the Iduapriem open pit mine; and the Obuasi Mine, which comprised both surface and underground operations. In 2004, gold production at the Obuasi Mine was hindered by intermittent unplanned mill shutdowns and mechanical failures. Total gold production at Obuasi for the eight months of May through December 2004 was 7,931 kilograms (kg) (reported as 255,000 troy ounces). In terms of growth prospects, the company planned to develop the deep-level ore deposits at Obuasi known as the Obuasi Deeps, which are expected to extend the project's mine life beyond 2040. The development of Obuasi Deeps will require an initial investment of $44 million during the next 5 years to conduct further exploration and feasibility studies. The total capital expenditures for the development of the Obuasi Deeps was estimated to be about $570 million (African Mining, 2004b; AngloGold Ashanti Ltd., 2005, p. 37).

At the Bibiani Mine, the company faced geotechnical problems at the main pit and mechanical problems at the mill and crushing circuit, which resulted in the unplanned processing of stockpiled material and lower than expected gold production. As a result, a total of 3,266 kg (reported as 105,000 troy ounces) was produced during the eight months of May through December 2004. The mine, which had operated between 1903 and 1968 as an underground mine, was reopened in 1998 as an open pit mine with a carbon-in-leach (CIL) plant. The mine included old tailings dumps, which were reclaimed in December 2004. The tailings were expected to yield about 4.7 million metric tons (Mt) at an estimated recovery grade of 0.60 gram per metric ton (g/t) gold over a period of 3 years. The company expected production at Bibiani to decrease to about 3,141 kg (reported as 101,000 troy ounces) in 2005 owing to the mining of smaller satellite pits and the processing of stockpiled material and old tailings. At the Iduapriem Mine, gold production for the eight months of May through December 2004 in which Iduapriem was part of AngloGold Ashanti was 4,572 kg (reported as 147,000 troy ounces). AngloGold Ashanti held an 80% interest in the Iduapriem Mine; the remaining 20% was held by the International Finance Corporation (AngloGold Ashanti Ltd., 2005, p. 38-39).

Golden Star Resources Ltd. commissioned its Wassa Mine in 2004. The mine, which is located about 150 kilometers (km) west of Accra, was owned by Golden Star (90%) and the Government of Ghana (10%). The mine had been in operation as an open pit heap-leach mine in the 1990s but was closed in 2001. Golden Star acquired the mine in 2002 after determining that conventional CIL processing was economically feasible. The construction of the 10,000-metric-tons-per-day (t/d) CIL processing plant was completed in late 2004. New open pit mining operations began in November 2004. The mine was expected to produce on average about 4,350 kilograms per year (kg/yr) of gold. As of December 31, 2004, total probable mineral reserves at Wassa were reported to be 19.3 Mt at a grade of 1.31 g/t gold, or about 25,000 kg of contained gold (Golden Star Resources Ltd., 2005, p. 6, 14-17).

In addition to the Wassa Mine, Golden Star operated the Bogoso/Prestea (or Bogosu/Prestea as it was previously known) open pit mine, which is located about 300 km west of Accra. Golden Star held a 90% interest in the property, and the Government of Ghana held the remaining 10%. All ore from the Bogoso and the Prestea pits was carried by truck to the 1.5 million-metric-ton-per-year (Mt/yr) Bogoso processing plant. The company planned to increase capacity at the plant to 3.5 Mt/yr by late 2006. As of December 31, 2004, total proven and probable mineral reserves at Bogoso/Prestea were reported to be 30.9 Mt at a grade of 2.83 g/t gold. In addition to the Bogoso and the Wassa processing plants, Golden Star planned to commission a third plant at Prestea. The plant, which will be known as the Bondaye plant, was acquired from Resolute Mining in 2003 for $4.3 million. Once refurbished and brought online, the plant is expected to produce about 3,700 kg/yr of gold. Golden Star was considering reopening the Prestea underground mine, if feasible. The company planned to spend $6.6 million of the $21 million that it had allocated for exploration in 2004 on the Prestea underground mine (African Mining, 2004a; Golden Star Resources Ltd., 2005, p. 9-10).

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Newmont Mining Corp. of the United States continued to develop its Ahafo and Akyem properties. The Ahafo property, which is located about 300 km northwest of Accra between the towns of Kenyase and Ntotoroso, comprised 11 ore bodies. The Akyem property is located in Ghana's eastern region about 130 km northwest of Accra between the towns of New Abirem and Ntronang. In 2004, Newmont increased its tenement area in the Akyem District by 1,536 km^2. (Newmont Mining Corp., 2004§).

According to Gold Fields Ltd., the Tarkwa open pit mine reached record production in 2004 by processing about 16 Mt of ore and produced 17,107 kg of gold. During the year, the company reported that it had completed about 91% of the construction of the new 4.2 Mt/yr mill and CIL plant and spent about $78 million of the $85 million assigned to the project. At the Damang Mine, Gold Fields reported that ongoing optimization of the mill feed blend and plant setup allowed for the treatment of almost 5% more tonnage than that of 2003, which resulted in the production of 9,589 kg of gold (Gold Fields Ltd., 2005§).

Industrial Minerals

Cement.—Ghana Cement Works Ltd. (Ghacem), which was controlled by Heidelberg Zement AG of Germany, operated Ghana's two clinker-grinding plants at the port cities of Takoradi and Tema. The capacity of each plant was 1.2 Mt/yr. In 2004, Ghacem acquired a mining license to develop a limestone deposit located in the country's eastern region. The company was to invest $2 million to produce limestone locally. Ghacem used imported clinker, gypsum, and limestone for the manufacturing of cement. By producing limestone locally, the country will reduce its dependence on imported limestone and clinker to supply its two cement plants (Aggregate Research Industries, 2004§; allAfrica.com, 2004b§; Ghana web, 2004§).

Mineral Fuels

In October 2004, Oil and Natural Gas Corporation (ONGC) Videsh Limited of India signed a Memorandum of Understanding with GNPC to establish bilateral cooperation in petroleum exploration and production (ONGC Videsh Limited, 2004§).

Between April and October 2004, land acquisition negotiations and compensation agreements for the West African Gas Pipeline (WAGP) were completed in Benin, Ghana, and Nigeria. Negotiations with Togolese landowners were ongoing during the year. Engineering, procurement, and construction contracts were awarded in December 2004 (West African Gas Pipeline Company Limited, 2005§). In November, the World Bank approved $125 million in guarantees to support the construction of the WAGP. The Multilateral Investment Guarantee Agency provided $75 million, which represented 90% of the equity investment of $83.4 million in Ghana by the West African Gas Pipeline Company Limited to insure against a breach of contract. The International Development Association provided $50 million for 22 years. As of November 2004, the total cost of the WAGP was estimated to be $590 million (World Bank Group, The, 2004§).

The Government planned to construct a $40.2 million petroleum products pipeline at Buipe in Ghana's northern region. The pipeline will transport diesel, gasoline, kerosene, and petroleum products 275 km through an 8-inch-diameter pipeline from Buipe in the northern region to Bolgatanga in the eastern region. The Government of Korea will finance $38.2 million, and the Government of Ghana will finance the remaining $2 million. The pipeline was expected to be completed by November 2005 (Alexander's Gas & Oil Connections, 2004§).

Infrastructure

The International Finance Corporation planned to invest $60 million in the Takoradi powerplant to increase capacity to 330 MW from 220 MW. The powerplant was 90% owned by CMS Energy and 10% by the Ghanian Government through the Volta River Authority. After construction of the WAGP, the plant would be fueled by natural gas instead of petroleum (Africa Energy Intelligence, 2004).

Plans were underway to construct a railway line to link the city of Ouagadougou in Burkina Faso to the Boankra inland port in Kumasi, Ghana. The proposed railway line would provide an alternative route to Ghana's Atlantic ports, bypassing Côte d'Ivoire, and would cost about $750 million. The African Development Bank had secured $5.4 million for a feasibility study. Until the advent of the civil war in Côte d'Ivoire, the railway line to the Abidjan Port was used by Burkina Faso, Mali, and Niger for their external trade. Since then, the three countries have had to divert their trade to other ports in West Africa, such as to the Takoradi and the Tema Ports in Ghana. Transit trade through the Tema Port was estimated to have increased to more than 700,000 t in 2003 from 20,000 t in 1999, which has affected traffic flow on Ghana's north-south highway from Tema to Paga (OT Africa Line, 2004§; Reuters, 2004§).

References Cited

Africa Energy Intelligence, 2004, IFC to finance CMS: African Energy Intelligence, March 10-23, no. 365, p. 6.

African Mining, 2004a, Golden Star on track to more than double gold production: African Mining, v. 9, no. 4, p. 46-57.

African Mining, 2004b, Obuasi's future lies at depth: African Mining, v. 9, no. 4, p. 58-61.

Africa Mining Intelligence, 2004a, BHP weighs bauxite projects' impact: Africa Mining Intelligence, March 14-27, no. 83, p. 2.

Africa Mining Intelligence, 2004b, Sysmin infusion for mapping survey: Africa Mining Intelligence, March 3-16, no. 80, p. 2.

AngloGold Ashanti Ltd., 2005, 2004 annual report: Johannesburg, South Africa, AngloGold Ashanti Ltd., 183 p.

Coakley, G.J., 2003, The mineral industry of Ghana, *in* Area reports—International—Africa and the Middle East: U.S. Geological Survey Minerals Yearbook 2003, v. III, p. 17.1-17.8

Environmental Protection Agency, 2006, Environmental Protection Agency Act—1994, Act 490: Ghana, Environmental Protection Agency, 17 p.

Golden Star Resources Ltd., 2005, 2004 annual report: Littleton, Colorado, Golden Star Resources Ltd., 84 p.

International Monetary Fund, 2004 (July), Ghana—Report on the observance of standards and codes—Fiscal transparency module: Washington DC, International Monetary Fund Country Report No. 04/203, 33 p.

Kaiser Aluminum Corp., 2004, Kaiser Aluminum completes sale of Valco interests: Houston, Texas, Kaiser Aluminum Corp. press release, November 1, 1 p.

Digitized by Google

Mining Journal, 2004, Valco buy approved: London, United Kingdom, Mining Journal, November 5, p. 6.
Mining Review Africa, 2004, Ghana keen on bauxite and aluminum integration: Mining Review Africa, no. 5, p. 4.
Organisation for Economic Co-operation and Development, 2005, 2004/2005 African economic outlook: Paris, France, Organisation for Economic Co-operation and Development, 540 p.

Internet References Cited

Aggregate Research Industries, 2004, Ghacem in Ghana to produce cement locally soon, accessed June 23, 2004, at URL http://www.aggregateresearch.com/extarticle.asp?id=4346.
Alexander's Gas & Oil Connections, 2004 (December 22), Ghana inaugurates new petroleum products pipeline project, accessed December 28, 2004, at URL http://www.gasandoil.com/goc/news/nta45103.htm.
allAfrica.com, 2004a, EU to support mining industry, accessed October 26, 2004, at URL http://fr.allafrica.com/stories/printable/200410210577.html.
allAfrica.com, 2004b, Ghacem to mine limestone for cement, accessed June 4, 2004, at URL http://fr.allafrica.com/stories/printable/200405171369.
AngloGold Ashanti Ltd., 2005, Arsenic remediation at Obuasi, accessed December 30, 2005, at URL http://www.anglogold.com/subwebs/informationforinvestors/reporttosociety04/regions/pdf/Obuasi.pdf.
Ghana web, 2004, (November 17) Limestone quarry for Ghacem inaugurated at Yongwase-Krobo, accessed June 22, 2005, at URL http://www.ghanaweb.com.
Gold Fields Ltd., 2005, 2004 online annual report, accessed June 22, 2005, at URL http://www.goldfields.co.za.
International Finance Corporation, 2006, Summary of project information—Project no. 23338, January 31, 2006, accessed March 15, 2006, at URL http://www.ifc.org/ifcext/spiwebsite1.nsf/b7a881f3733a2d0785256a550073ff0f/eef7f820b139936a8525706c006f4e70?OpenDocument.
International Monetary Fund, 2005 (September), Ghana, World Economic Outlook Database, accessed December 13, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.
Newmont Mining Corp., 2004, Akyem—Overview, accessed December 29, 2005, at URL http://www.newmont.com/en/operations/projectpipeline/akyem/index.asp.
ONGC Videsh Limited, 2004, OVL signs MOU with Ghana's National Oil Company, accessed January 1, 2006, at URL http://www.ongcvidesh.com/displayit.asp?pathit=/beta/press/press75.txt.
OT Africa Line, 2004, New rail line planned to link Burkina Faso to the coast, accessed December 30, 2005, at URL http://www.otal.com/images/OTAL Services/mrjuly2004.pdf.
Republic of Ghana, 2004, Extractive industries transparency initiative launched in Tarkwa, accessed July 2, 2004, at URL http://www.ghana.gov.gh/investing/article.php?id=0000.
Reuters, 2004 (May 20), Ghana, Burkina eye rail link to bypass Ivory Coast, accessed May 21, 2004, at URL http://biz.yahoo.com/rm/040520/transport_westafrica_2.html.
U.S. Census Bureau, 2005a, U.S. exports to Ghana from 2000 to 2004 by 5-digit end-use code, accessed December 29, 2005, at URL http://www.census.gov/foreign-trade/statistics/product/enduse/exports/c7490.html.
U.S. Census Bureau, 2005b, U.S. imports from Ghana from 2000 to 2004 by 5-digit-end-use code, accessed December 29, 2005, at URL http://www.census.gov/foreign-trade/statistics/product/enduse/imports/c7490.html.
West African Gas Pipeline Company Limited, 2005, Development status and forecast schedule, accessed January 3, 2006, at URL http://wagpco.gap.chevrontexaco.com/devstatus.htm.
World Bank Group, The, 2004 (November 23), World Bank approves funding for the West African Gas Pipeline in Benin, Ghana, Nigeria & Togo, accessed January 3, 2006, at URL http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/TOGOEXTN/contentMDK:20285812~menuPK:375271~pagePK:141137~piPK:141127~theSitePK:375265,00.html.
World Bank Group, The, 2005, Ghana Data Profile, accessed January 5, 2006, at URL http://devdata.worldbank.org/external/CPProfile.asp?PTYPE=CP&CCODE=GHA.

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TABLE 1
GHANA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004[e]
Aluminum:						
Bauxite, gross weight		504	678	684	495	498 [3]
Metal, smelter, primary		137	144	117	16	--
Cement, hydraulic[4]		1,950	1,900	1,900	1,900	1,900
Diamond:						
Gem[e]	thousand carats	700	936	770	724	725
Industrial[e]	do.	178	234	193	180	180
Total[5]	do.	878	1,170	963	904 [r]	905 [3]
Gold[6]	kilograms	72,080	68,341	69,271	70,749 [r,3]	63,139 [3]
Manganese:						
Ore, processed		896	1,077	1,136	1,509	1,597 [3]
Mn content[e]		287	344	363	528 [r]	559 [3]
Natural gas	million cubic meters	--	--	--	112	112
Petroleum:						
Crude	thousand 42-gallon barrels	2,555	3,285	2,555	3,000 [e]	3,000
Refinery products:[e]						
Liquefied petroleum gas	do.	-- [3]	-- [3]	625	625	625
Gasoline	do.	2,190 [3]	2,445 [3]	5,850	5,850	5,850
Jet fuel	do.	730 [3]	511 [3]	625	625	625
Kerosene	do.	365 [3]	767 [3]	1,950	1,950	1,950
Distillate fuel oil	do.	2,555 [3]	2,628 [3]	4,450	4,450	4,450
Residual fuel oil	do.	1,825 [3]	1,862 [3]	1,250	1,250	1,250
Other including refinery fuel and losses	do.	730 [3]	767 [3]	1,250	1,250	1,250
Total	do.	8,390 [3]	8,980 [3]	16,000	16,000	16,000
Salt[e]		150	68	99	250	265 [3]
Silver, content of exported doré	kilograms	6,101	1,945	2,129	3,379 [r,3]	3,329 [3]
Steel, secondary, rebar[e]		75	75	75	75	75

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. -- Zero.

[1]Table includes data available through November 2005.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) are produced, as are limestone and lime for the processing of some gold ore and salt. Output of these commodities is not reported and information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]All from imported clinker.

[5]Production, in thousand carats, includes that of Akwatia Mine: 2000--233; 2001--300 (estimated); 2002--268, and 2003--240 (estimated). Remainder are artisanal sales to the Precious Metals Marketing Corporation. Estimates of unreported artisanal production are not included.

[6]Does not include estimate of smuggled or undocumented production.

Sources: Ghana Minerals Commission and company reports.

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The Mineral Industry of Guinea

By Omayra Bermúdez-Lugo

In 2004, Guinea's mineral production consisted mainly of alumina, bauxite, cement, diamond, gold, and salt. Undeveloped mineral resources included graphite, iron, limestone, manganese, nickel, and uranium. The mining sector accounted for more than 80% of exports, 25% to 30% of Government revenues, and 17% to 20% of the gross domestic product (GDP) (Ministry of Mines and Geology, 2005a).

Real GDP was estimated to have increased by 2.7% compared with 1.2% in 2003 mostly owing to a modest increase in the construction, public works, and service sectors. According to the International Monetary Fund (2005, p. 5), Guinea's economic activities remained weak in 2004 and were adversely affected by cement shortages, electricity outages, instability in neighboring countries, and little investment by the private sector as a result of the uncertainty of the internal political environment. The country's GDP at purchasing power parity was estimated to be about $17.8 billion in 2004 (International Monetary Fund, 2005§[1]).

Government Policies and Programs

The Centre de Promotion et de Developpement Minière (CPDM), in cooperation with the World Bank and Co-opération Française, deals with mining investments (Wright, 2004). Guinea's Mining Code provides for five types of licenses, which include a reconnaissance license, a prospecting permit, an operating permit, a mining concession, and an artisanal operating permit. Reconnaissance licenses are issued by the Direction Nationale des Mines (DNM) upon recommendation of CPDM for a maximum term of 3 months and are renewable once for an additional 3 months. Application for a prospecting permit must be made to the Ministry of Mines and registered at the CPDM. The permit may be obtained for a term of 2 or 3 years and may be renewed twice for a maximum of 2 years for each renewal. With each renewal, the prospecting area is reduced by one-half. Application for an operating permit must be made to the Ministry of Mines; the permit is valid for a maximum of 10 years. The application must include an environmental impact study and a rehabilitation plan. An operating permit may be extended more than once for a maximum of 5 years for each renewal. Mining concessions are granted by Presidential decree upon recommendation of the Minister of Mines for a period of 25 years and may be renewed for an additional 10 years (Mining Promotion and Development Center, 2005).

[1]References that include a section mark (§) are found in the Internet References Cited section.

Commodity Review

Metals

Bauxite and Alumina.—Bauxite was Guinea's major source of foreign currency. In 2004, Guinea continued to rank among the world's top five producers of bauxite. Guinea's bauxite-bearing regions were Lowland-Guinea, Upper-Guinea, and Mid-Guinea. Bauxite resources in these regions were estimated to be 5 billion metric tons (Gt), 2 Gt, and 500 million metric tons (Mt), respectively, and ranged between 44% and 53% Al_2O_3 and between 2% and 3% SiO_2 (Ministry of Mines and Geology, 2005a). The three companies that operated in the Lowland-Guinea region were Alumina Company of Guinea (ACG), Compagnie des Bauxites de Guinée (CBG), and Compagnie des Bauxites de Kindia (CBK).

ACG was a joint venture between Russian Aluminum Group (Rusal) (85%) and the Government (15%). The company mined bauxite from the Friguia deposits and refined the ore into alumina onsite. The alumina was transported by railway to the Conakry harbor where it was exported (Ministry of Mines and Geology, 2005a).

In early 2004, Rusal planned to conduct a feasibility study to expand the Friguia alumina refinery and increase production capacity to 1.4 million metric tons per year (Mt/yr) from its existing capacity of 700,000 metric tons per year (t/yr). The study was to be conducted by Hatch Associates of Canada and All-Russia Aluminium and Magnesium Institute (a subsidiary of Rusal). The estimated cost of the expansion was $350 million. The engineering, procurement, and construction phases of the project were scheduled for early 2005 (Engineering and Mining Journal, 2004).

CBG was a joint venture between Halco Mining Inc. (51%) and the Government (49%). In 2004, Comalco Limited (a subsidiary of Rio Tinto plc) sold its 4% stake in Halco to the remaining shareholders. Following the sale, ownership in Halco was distributed between Alcan Inc. (45%), Alcoa Inc. (45%), and Dadco Group (10%). CBG produced between 11 and 14 Mt/yr of bauxite at an average grade of 53% Al_2O_3 and 2% SiO_2. Halco shareholders bought bauxite from CBG for use in their own production processes (Industrial Minerals, 2004; Ministry of Mines and Geology, 2005a).

CBG's production came from three bauxite deposits at Bidikoum, Sangaredi, and Silidara. The resource for these deposits was estimated to be over 300 Mt. Historically, the ore grade at the Bidikoum deposit was 50% Al_2O_3; at Sangaredi, 56% to 58% Al_2O_3; and at Silidara, 52% Al_2O_3. About 85% to 90% of the ore mined by CBG came from the Bidikoum and

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Silidara deposits. The run-of-mine ore was stockpiled along the mine's rail sidings and consisted of material from different pits to provide a consistent blend. The ore was then transported to a treatment plant in Kamsar where it was crushed and dried (from an average 12.5% moisture to 6.7% moisture for shipping), then stockpiled, transported along the plant's 1.6 kilometer (km)-long jetty to ship loaders, and exported (Ministry of Mines and Geology, 2005a; Mining-technology.com, 2004§).

In May 2004, Alcan and Alcoa signed a memorandum of understanding to jointly build a new 1.5-Mt/yr alumina refinery in Kamsar. In November, the two companies and the Government signed a protocol of negotiation for the development of the refinery. A feasibility study for the alumina plant was underway during the year. The study's expected completion date was mid-2005. The Kamsar refinery was expected to begin production in 2008 (Alcan Inc., 2004; Industrial Minerals, 2004; Ministry of Mines and Geology, 2005a).

CBK was 100% owned by Rusal, which mined the Debele deposits. Annual output ranged between 1.4 and 2.0 Mt of ore at a grade of 45% to 46% Al_2O_3 and 2.9% SiO_2. Bauxite was transported by railway to the Conakry harbor and exported to the Nikolaev refinery in Ukraine (Ministry of Mines and Geology, 2005a).

The bauxite potential at the Tougue and Dabola areas, which are located within the Upper-Guinea region, was estimated to be 2 Gt at a grade of 44.1% Al_2O_3 and 2.6% SiO_2. The Société des Bauxite de Dabola-Tougué was interested in mining these areas as soon as the Transguinean Railway is constructed (Ministry of Mines and Geology, 2005a).

In October 2004, Global Alumina Products Corporation (GAPCO) signed an investment and concession agreement with the Government to build a 2.8-Mt/yr alumina refinery in Sangaredi. Construction work was scheduled to begin in mid-2005 and production of the first alumina was scheduled for 2008 at a cost of $2 billion (Global Alumina Products Corporation, 2004; Ministry of Mines and Geology, 2005a).

Gold.—Gold occurred as veins and alluvial deposits and was mined on artisanal, small, and industrial scales. The country's main gold-bearing area was the Siguiri basin, which is located within the Upper-Guinea region. Gold was also found in the Fitaba, N'Zerekore, and Sierra-Fore areas. More than 100 gold prospecting licenses were granted in Guinea between 1999 and 2003. Gold was produced by Société Ashanti de Guinée (SAG), Société Minière de Dinguiraye (SMD), Société d'Exploitation Minière d'Afrique de l'Ouest-Guinée (SEMAFO-Guinée), and small-scale and artisanal miners (Ministry of Mines and Geology, 2005c).

SAG, which was owned by AngloGold Ashanti Ltd. (85%) and the Government (15%), operated the Siguiri gold mine. AngloGold Ashanti was created in April 2004, following the merger of AngloGold Limited and Ashanti Goldfields Limited. In 2004, production at the Siguiri Mine fell to 2,582 kilograms (kg) from 7,863 kg in 2003. The company attributed the fall in production to the Government's embargo on gold sales and on imports of fuel during the second quarter of the year, and to a shortage of cement supplies, which resulted in a reduction of crushing and stacking operations (Ministry of Mines and Geology, 2005c; AngloGold Ashanti, 2005§). The Government placed an embargo on the supply of diesel fuel to the Siguiri gold mine and on exports of its gold bullion in May 2004, pending renegotiation of the terms of AngloGold Ashanti's contract (Africa Mining Intelligence, 2004). The Government lifted the embargo in August 2004 as negotiations were resumed (AngloGold Ashanti, 2004§). SAG planned to construct a new processing plant with a capacity to process 12 t/yr of gold. The Siguiri Mine is located in the Prefecture of Siguiri about 850 km northeast of Conakry. Gold was mined from primary gold deposits (Ministry of Mines and Geology, 2005c).

SMD, which was owned by Guinor Gold Corp. of Canada (85%) and the Government (15%), mined gold deposits at the Leró Mine. The Leró gold mine was located at the border between the Prefectures of Siguiri and Dinguiraye. In 2004, gold production, which came from the Fayalal and Tambico deposits, fell to about 2,403 kg (reported as 77,245 troy ounces) from 2,884 kg in 2003 (Guinor Gold Corp., 2005§). Guinor was conducting a feasibility study at Leró to determine future drilling target areas. In June, RSG Global Pty Ltd. of Australia, which was the company in charge of the study, announced a new estimate of measured and indicated resources of 54 Mt at a grade of 1.6 grams per metric ton (g/t) gold, with measured resources comprising 25 Mt at a grade of 1.8 g/t gold (Mining Journal, 2004). SMD planned to build a new carbon-in-leach (CIL) processing plant to process sulfide ore at the Leró Mine; in November, however, the company announced that it had entered into a Heads of Agreement to purchase an existing CIL plant in Indonesia from a subsidiary of Rio Tinto. The overall cost of the purchase, which included a metallurgical plant, powerplant, accessories and spares, and dismantling, packaging and loading onto barges, will be $15 million. A $1 million deposit will be required when the definitive sale and purchase agreement is reached. The plant was expected to become available by the end of the first quarter of 2005. Once running, the average throughput was estimated to be nearly 6 Mt/yr of ore (Guinor Gold Corp., 2004).

SEMAFO-Guinée operated the Kiniero Mine, which is located near the town of Kouroussa about 650 km east of Conakry. The company, which was owned by Semafo Inc. of Canada (85%) and the Government (15%), began production at the Kiniero Mine in 2002. The mine produced about 1,277 kg (reported as 41,049 troy ounces) of gold in 2004. As of December 2004, measured and indicated resources at Kiniero were reported to be about 5.3 Mt at a grade of 3.22 g/t gold (Semafo Inc., 2005).

Artisanal production was sold to collectors or directly to the Central Bank of Guinea, which owned two buying counters in Conakry and Kankan (Ministry of Mines and Geology, 2005c).

Other companies that were either exploring for gold in the country or in the process of acquiring a participating interest in gold projects were Chester Mining Ltd. of Australia, and Canadian companies Mano River Resources Inc. and Pro-Veinor Resources. In September, Cassidy Gold Corp. announced that it had acquired a 75% interest in Societe Minière Africaine S.A.R.L., which held the Tambiko and Siguiri exploration permits (Cassidy Gold Corp., 2004). Chester Mining completed a soil sampling program for its Kosoko and Saranfora properties

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and applied for a 1-year extension of its exploration permit for these properties (Chester Mining Ltd., 2004).

Iron Ore.—Guinea hosted the Mount Nimba and Simandou iron ore deposits in the southeastern part of the country. The iron content of these Banded Iron Formation deposits was estimated to be between 66% and 68%. Lateritic iron deposits occurred in Lowland-Guinea and included the Kaloum Peninsula deposit in Conakry and other deposits in Forecariah. Other iron ore occurrences were identified in Upper-Guinea, Mid-Guinea, and Forested-Guinea (Ministry of Mines and Geology, 2005d).

Mount Nimba is a 25-km-long mountain range in Forested-Guinea that borders Côte d'Ivoire and Liberia. The Mount Nimba iron ore deposit is subdivided into four ore bodies: Château, Grands Rochers, Pierre-Richaud, and Sempere. Resources at Mount Nimba were estimated to be more than 1 Gt of iron ore at a grade of 63% to 68% iron. A mining agreement for the exploitation of the Mount Nimba deposit was signed in April 2003, and a new mining company was created under the name of Société des Mines de Fer de Guinée. The company was owned by Euronimba (85%) [a consortium formed by BHP Billiton Plc of the United Kingdom (43.5%), Newmont Mining Corp. of the United States through Newmont-LaSource (43.5%), and the Areva/Cogema Group of France through its subsidiary Cominor (13%)], the Government (10%), and Mifergui-Nimba (5%). The envisioned mining rate at Mount Nimba was 20 Mt/yr of iron ore (Ministry of Mines and Geology, 2005d).

Simandou, which is a 115-km-long mountain range along the Beyla, Kerouane, and Macenta Prefectures, hosts the Pic de Fon iron ore deposit. Resources at Pic de Fon were estimated to be about 1.2 Gt of iron ore at a grade of about 65% to 68% iron. Rio Tinto considered mining the deposit at a rate of 25 Mt/yr at first and then at a rate of 40 Mt/yr. The feasibility of the project would depend upon the construction of the Transguinean Railway. A mining agreement between Rio Tinto and the Government was signed in November 2002 and ratified in February 2003. The concession was to be granted to SIMFER SA Guinea, which was a subsidiary of Rio Tinto (Ministry of Mines and Geology, 2005d).

Industrial Minerals

Diamond.—Guinea's main diamond deposits were located in Kerouane, Kissidougou, and Macenta along the Baoule, Diani, and Milo Rivers. Other diamond occurrences were identified in Forecariah and Kindia. The country's diamond resources were estimated to be between 25 and 30 million carats. Diamond was mined from alluvial, eluvial, and kimberlite deposits (Ministry of Mines and Geology, 2005b). Guinea was a participant in the Kimberley Process (Wright, 2004).

In 2004, national diamond production rose to 739,891 carats from 666,000 carats in 2003. About 700,000 carats was produced by artisanal and small-scale miners and the remaining was produced by the Aredor-First City Mining Company (Aredor-FCMC), which was a joint venture between Trivalence Mining Corporation of Canada (85%) and the Government (15%). Artisanal and small-scale mining was concentrated mainly in the Banankoro area in Kerouane, on lands reserved by the Government in the Aredor-FCMC SA concession, and in Kindia. Aredor-FCMC mined along the Boule River and its tributaries and produced on average between 12,000 and 38,000 carats per year (Ministry of Mines and Geology, 2005b).

Diamond was exported through the National Bureau of Expertise (BNE), which evaluated the diamonds and issued Certificates of Origin in compliance with the Kimberley Process. BNE collected a 3% tax on diamond exports (Ministry of Mines and Geology, 2005b).

Rio Tinto Mining and Exploration Limited, a subsidiary of Rio Tinto, and a subsidiary of the South African De Beers Company were some of the companies that held diamond exploitation and/or exploration permits in Guinea in 2004 (Ministry of Mines and Geology, 2005b).

Mineral Fuels

Petroleum.—In 2004, Guinea did not produce or refine petroleum and was dependent upon imports for its petroleum requirements.

Infrastructure

Guinea had three active railway lines, which connected the Debele, Fira, and Sangaredi Mines to the Conakry harbor. A fourth line that connected Kankan to Conakry was out of use during 2004 (Ministry of Mines and Geology, 2005a). Rio Tinto and Euronimba planned to finance a bankable feasibility study for the Transguinean Railway, which will run from Lola, which is located near Mount Nimba to Matakang, which is located southeast of Conakry. The project included the construction of a deep-water harbor in Matakan. The envisioned railway will have a capacity to transport about 60 Mt/yr of ore and was estimated to cost $2.5 billion (Ministry of Mines and Geology, 2005d).

Outlook

The International Monetary Fund (2005, p. 8) foresees Guinea's economy reaching a real GDP growth of 3% in 2005, primarily as a result of an economic rebound in the mining sector, and the picking up of the trade and services sectors. The rebound in the mining sector was attributed to a continued increase in private investments.

References Cited

Africa Mining Intelligence, 2004, Standoff between Jonah and Conte: Africa Mining Intelligence, no. 87, June 16-19, p. 1.

Alcan Inc., 2004, Alcan, Alcoa, Government of the Republic of Guinea sign protocol for alumina refinery in Guinea: Montreal, Quebec, Canada, Alcan Inc. press release, November 24, 1 p.

Cassidy Gold Corp., 2004, Cassidy Gold Corp. acquires 75% of Minière Africaine: Kamloops British Columbia, Canada, Cassidy Gold Corp. press release, September 24, 1 p.

Chester Mining Ltd., 2004, Kosoko gold project—Guinea, West Africa: Sydney, Australia, Chester Mining Ltd. press release, July 29, 2 p.

Engineering & Mining Journal, 2004, Rusal studying Guinea alumina expansion: Engineering & Mining Journal, v. 205, no. 4, April, p. 14.

Digitized by Google

Global Alumina Products Corporation, 2004, Global Alumina signs definitive concession agreement with Republic of Guinea for its proposed alumina refinery: Boke, Guinea, Global Alumina Products Corporation press release, October 18, 2 p.
Guinor Gold Corp., 2004, Guinor expects significant fall in Capex with agreement to purchase Kelian plant: London, United Kingdom, Guinor Gold Corp. press release, November 12, 3 p.
Industrial Minerals, 2004, Guinea bauxite supply changes: Industrial Minerals, no. 443, August, p. 14.
International Monetary Fund, 2005 (June), Guinea staff-monitored program: Washington, DC, IMF country report no. 05/222, 61 p.
Mining Journal, 2004, Leró resource grows: London, United Kingdom, Mining Journal, June 25, p. 11.
Mining Promotion and Development Center, 2005 (February), Procedures for the granting of mining licenses: Conakry, Guinea, Mining Promotion and Development Center information sheet, 2 p.
Ministry of Mines and Geology, 2005a (February), Guinea bauxite mineral resources: Conakry, Guinea, Ministry of Mines and Geology information sheet, 2 p.
Ministry of Mines and Geology, 2005b (February), Guinea diamond mineral resources: Conakry, Guinea, Ministry of Mines and Geology information sheet, 2 p.
Ministry of Mines and Geology, 2005c (February), Guinea gold mineral resources: Conakry, Guinea, Ministry of Mines and Geology information sheet, 2 p.
Ministry of Mines and Geology, 2005d (February), Guinea iron mineral resources: Conakry, Guinea, Ministry of Mines and Geology information sheet, 2 p.
Semafo Inc., 2005, Semafo increases its total mineral reserves by 63% to 1.4 M ounces: Montreal, Quebec, Canada, Semafo Inc. press release, March 2005, 3 p.
Wright, Leslie, 2004, Republic of Guinea, *in* Mining Annual Review: London, United Kingdom, Mining Communication Ltd., CD-ROM.

Internet References Cited

AngloGold Ashanti, 2004, Government of Guinea lifts embargo on export of gold bullion, accessed August 25, 2004, via URL http://www.anglogold.com.
AngloGold Ashanti, 2005, Review of operations—2004 annual report, accessed August 29, 2005, at URL http://www.anglogold.com/subwebs/InformationForInvestors/AnnualReport04/report/review_of_year/guinea.htm.
Guinor Gold Corp., 2005, 2004 production, accessed August 29, 2005, at URL http://www.guinor.com/ops_expl/dinguiraye.htm.
International Monetary Fund, 2005 (April), Guinea, World Economic Outlook Database, accessed August 9, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.
Mining-technology.com, 2004, CBG bauxite (aluminium ore) mining operations, Guinea, accessed December 3, 2004, at URL http://www.mining-technology.com/projects/cbg.

TABLE 1
GUINEA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[e]
GUINEA[2]						
Alumina:						
Production:						
Hydrate		-- [r]	-- [r]	44 [r]	8 [r]	9
Calcined		571 [r]	644 [r]	680 [r]	730 [r]	770
Shipments, calcined		571 [r]	644 [r]	724 [r]	738 [r]	779
Bauxite:						
Mine production:						
Wet basis[3]		17,950	17,267	17,480	17,044	17,000
Dry basis[e, 4]		15,700 [5]	15,100	15,300	15,000	15,000
Calcined		100 [e]	75	--	--	--
Shipments (dry basis):						
Metallurgical		14,213 [r]	13,842 [r]	14,087 [r]	13,939 [r]	14,000
Calcined		100 [e]	77 [r]	--	--	--
Cement		300	315	360	360 [e]	360
Diamond[6, 7]	thousand carats	327 [r]	364	491	666	740 [5]
Gold[7]	kilograms	15,788 [r]	16,205 [r]	16,815 [r]	16,622 [r]	10,700
Salt[e]		15	15	15	15	15

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.
[1]Table includes data available through August 29, 2005.
[2]In addition to the commodities listed, Guinea produced modest quantities of crude construction materials (clays, sand and gravel, and stone), but information is inadequate to make reliable estimates of output levels.
[3]Metallurgical ore plus calcinable ore estimated to be 13% water.
[4]Data are for wet-basis ore estimated to be 13% water reduced to dry basis estimated to be 3% water.
[5]Reported figure.
[6]Production is approximately 70% to 80% gem quality.
[7]Figures include artisanal production.

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TABLE 2
GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Alumina		Alumina Company of Guinea (Russian Aluminum Group, 85%, and Government, 15%)	Friguia plant	700,000.
Bauxite		Compagnie des Bauxites de Guinée [Government, 49%, and Halco Mining Inc., 51% (Halco Mining was a consortium formed by Alcoa Inc., 45%; Alcan Inc., 45%; and Dadco Group, 10%)]	Kamsar and Sangaredi	14,000,000.
Do.		Compagnie des Bauxites de Kindia (Russian Aluminum Group 100%)	Kindia	2,000,000.
Do.		Alumina Company of Guinea (Russian Aluminum Group, 85%, and Government, 15%)	Friguia Mine	2,300,000.
Cement		Ciments de Guinee (Holcim Ltd., 51%, and Government, 44%)	Conakry plant	360,000.
Diamond	carats	Aredor-First City Mining Company (Government, 15%, and Trivalence Mining Corporation, 85%)	Aredor Mine	38,000.
Do.	carats	Artisanal miners	Mainly in Banankoro	700,000.
Gold		Société Ashanti de Guinée (AngloGold-Ashanti, 85%, and Government, 15%)	Siguiri Mine	9,000,000 ore.
Do.	kilograms	do.	do.	9,300 gold.
Do.		Société Minière de Dinguiraye (Guinor, 85%, and Government, 15%)	Lero-Karta Mine	1,100,000 ore.
Do.	kilograms	do.	do.	3,500 gold.
Do.		Societe d'Exploitation Minière d'Afrique de l'Ouest Guinée (Semafo Inc., 85%, and Government, 15%)	Kiniero Mine	400,000 ore.
Do.	kilograms	do.	do.	1,700 gold.

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The Mineral Industry of Kenya

By Thomas R. Yager

The mineral industry in the East African country of Kenya was noted chiefly for its production of fluorspar, salt, and soda ash. Other industrial minerals produced in recent years included diatomite, feldspar, gypsum, lime, silica sand, and vermiculite. Building materials produced included cement, coral, granite, limestone, marble, and shale. Kenya produced small amounts of gold, iron ore, lead, secondary aluminum, and steel. The country also produced carbon dioxide gas, gemstones, and refined petroleum products (table 1).

In 2004, Kenya's real gross domestic product (GDP) increased by 3.1% after rising by 1.6% in 2003. The nominal GDP based on purchasing power parity was nearly $35 billion; the per capita GDP based on purchasing power parity was about $1,100. In 2004, manufacturing accounted for 10% of the GDP; building and construction, 4%; electricity and water, 2%; and mining and quarrying, less than 1% (Central Bank of Kenya, 2005b, p. 17; International Monetary Fund, 2005, p. 208; 2005§[1]).

The mining and quarrying sector grew by 2.3% in 2004 compared with 2.9% in 2003 and 1.8% in 2002. Growth in 2004 was partially attributable to higher production of fluorspar and soda ash. The manufacturing sector grew by 4.1% in 2004; building and construction, 3.5%; and electricity and water, 2.1% (Central Bank of Kenya, 2005b, p. 17).

Commodity Review

Metals

Gold.—Kenya's gold production was artisanal and small-scale. National exports of gold amounted to 1,543 kilograms (kg) in 2003 compared with 1,477 kg in 2002 and 388 kg in 1998. In December 2004, Muungano Gold Prospecting Group of Kenya employed about 1,500 miners at six small-scale gold mines in Lirhembe in the Kakamega District. Kansai Mining Corp. completed a drilling program at Migori in southwestern Kenya in the second quarter of 2004. Resources at Migori were estimated to be about 39 metric tons (t) of contained gold. AfriOre Ltd. commenced a drilling program at Masumbi on the Ndori prospect in western Kenya. International Gold Exploration AB of Sweden held Lolgorien and other properties in the western part of the country (Mining Journal, 2004; Oywa and Amadala, 2004; M.J. Njeru, Mines and Geology Department, written commun., August 7, 2003).

Iron and Steel.—Kenya mined small amounts of iron ore for use in cement production. The country's four rolling mills had a capacity of 220,000 metric tons per year (t/yr) and relied upon imported billet (table 2). Madvhani Group of Uganda was considering the reopening of Emco Steelworks and Emco Billets in Nairobi to provide a stable billet supply for its rolling mill in Uganda. These plants have increased their profitability because of the cessation of dumping of Russian and Ukrainian steel in East Africa (Metal Bulletin, 2004).

The International Iron and Steel Institute (2004, p. 81, 91) estimated that Kenya's imports of semimanufactured and finished steel products amounted to 381,000 t in 2003 compared with 411,000 t in 2002 and 250,000 t in 1998. From 1998 to 2003, Kenya's apparent consumption of finished steel rose to 399,000 t from 268,000 t.

Titanium and Zirconium.—Tiomin Resources Inc. of Canada held licenses for the Kilifi, Kwale, Mambrui, and Vipongo heavy mineral sands deposits. The company planned to mine at Kwale; Tiomin expected to begin the 20-month construction phase in the second quarter of 2005. During the first 6 years of the project, Tiomin was expected to produce 330,000 t/yr of ilmenite, 77,000 t/yr of rutile, and 37,000 t/yr of zircon. The expected mine life was 13 years. Capital costs were estimated to be $120 million (Tiomin Resources Inc., 2004a, b).

Industrial Minerals

Cement.—Kenya had three cement producers with a combined capacity of 2.75 million metric tons per year (Mt/yr). National cement production increased to nearly 1.79 Mt in 2004 from a revised 1.66 Mt in 2003. Athi River Mining Ltd. (ARM) planned to increase capacity at its plant at Kaloleni to 200,000 t/yr from 120,000 t/yr starting in the first quarter of 2005 (Daily Nation, 2004; Central Bank of Kenya, 2005a, p. 22; Wahome, 2005).

In 2004, Bamburi Cement Ltd. had a 57% share of the domestic cement market; East African Portland Cement Co. Ltd., 38%; and ARM, 5%. In 2004, Kenya's cement consumption rose to 1.69 Mt from nearly 1.27 Mt in 2003 (Akumu, 2004; Central Bank of Kenya, 2005a, p. 22).

Diatomite.—African Diatomite Industries Ltd. produced high-grade diatomite at Kariandusi and Soysambu in the Nakuru District. Production fell sharply in 2003 (table 1) because of the closure of some domestic companies that consumed diatomite (Mining Journal, 2004).

Fluorspar.—Kenya Fluorspar Ltd. mined fluorspar in the Keiro Valley; the company produced 108,000 t in 2004 compared with 95,278 t in 2003. Most of the company's production was exported. Kenya Fluorspar planned to increase its processing plant capacity to 144,000 t/yr in 2005 from 132,000 t/yr in 2004 and 120,000 t/yr in 2003 (Crossley, 2004).

Gemstones.—Kenya produced gemstones that included amethyst, aquamarine, cordierite, green garnet (tsavorite), ruby, sapphire, and tourmaline. Rockland Kenya Ltd., which operated the John Saul ruby mine, was the leading producer and exporter of ruby. National ruby production fell to 2,310 kg in 2003 from 3,043 kg in 2002 and 4,001 kg in 1998. Corby Ltd. and Kwirintori Mining Society planned to mine ruby in the Baringo District. In November 2004, the companies were

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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discussing compensation with residents of Baringo (Mkawale, 2004; M.J. Njeru, Mines and Geology Department, written commun., August 7, 2003).

Salt.—Magadi Soda Ash Ltd. (a subsidiary of Brunner Mond Group Ltd.) extracted salt from Lake Magadi as a byproduct of the soda ash production process. In 2003, salt output from Lake Magadi was 21,199 t compared with 18,848 t in 2002 and 21,742 t in 1998 (M.J. Njeru, Mines and Geology Department, written commun., August 7, 2003).

Soda Ash.—Magadi mined trona from Lake Magadi. The production of soda ash rose to 355,380 t in 2004 from 352,560 t in 2003 and 245,680 t in 1999. More than 95% of Magadi's output was exported to other African countries, India, the Middle East, and southeast Asia (Central Bank of Kenya, 2005a, p. 22; M.J. Njeru, Mines and Geology Department, written commun., August 7, 2003).

In 2004, Magadi started work on its new processing plant and repairs to its railway. The European Investment Bank, the International Finance Corporation, and Netherlands Development Finance Company FMO agreed to provide $55 million of the necessary funds; Magadi would finance the remaining $43 million. The new plant would have a production capacity of 365,000 t/yr; production was expected to start in mid-2006. The current plant was expected to operate at full capacity until the new plant was commissioned; production would subsequently decline to 75,000 t/yr by 2008 (International Finance Corporation, 2003, p. 1; Brunner Mond Group, 2004).

Mineral Fuels

Petroleum.—Kenya Petroleum Refineries Ltd. produced refined petroleum products from imported crude petroleum. In 2004, the company's output of refined petroleum products increased by about 16% (Central Bank of Kenya, 2005a, p. 23).

Woodside Energy Ltd. of Australia (50%), Dana Petroleum plc (30%), and Star Petroleum International (Kenya) Ltd. (20%) [a subsidiary of Global Petroleum Ltd. of Australia] entered into a joint-venture agreement to explore in offshore Blocks L5, L7, L10, and L11. The companies planned to drill a well in Block L5 by the end of 2005. In 2004, Woodside withdrew from its joint venture with Afrex Ltd. and Pancontinental Oil and Gas NL of Australia for exploration in offshore Blocks L6, L8, and L9. Pancontinental, which held a 40% share in Afrex, announced plans to buy Afrex's remaining shares in November (Africa Energy Intelligence, 2004a; Dana Petroleum plc, 2004).

Infrastructure

The state-owned Kenya Electricity Generating Co. Ltd. (Kengen) generated most of Kenya's electric power. In October 2004, construction resumed on the 60-megawatt (MW) Sondu Miriu hydroelectric plant; Kengen planned to complete the plant in 2007. A proposed second phase would add 21 MW of capacity at Sondu Miriu. In March, the Government announced plans to reduce its share in Kengen from 100% to 30%, and in Kenya Power and Lighting Company, to 39% from 50.8% (Africa Energy Intelligence, 2004b; African Energy Journal, 2004).

Kenya produced 5,033 gigawatthours (GWh) of electricity in 2004 compared with 4,662 GWh in 2003. In 2004, hydroelectric sources accounted for 59.8% of the country's total supply of electricity; thermal, 20.6%; and geothermal, 19.6%. Droughts in the third quarter of 2004 decreased the share of hydroelectric power; the share of geothermal power nearly doubled because of the commissioning of the Okaria II plant in November 2003. Imports from Uganda fell by 14.6%. Electricity consumption rose to 4,219 GWh in 2004 from 3,911 GWh in 2003 (Central Bank of Kenya, 2005a, p. 23).

Outlook

Kenya's GDP was forecasted to grow by 3.3% in 2005 and 3.7% in 2006. In 2005, the resumption of international donor support was expected to support public sector construction projects that would increase cement demand. The outlook for fluorspar, soda ash, and titanium minerals depended heavily upon global market trends (Central Bank of Kenya, 2005a, p. 2, 22; International Monetary Fund, 2005, p. 208).

References Cited

Africa Energy Intelligence, 2004a, East Africa—PanContinental buys Afrex: Africa Energy Intelligence, no. 381, November 17-30, p. 5.

Africa Energy Intelligence, 2004b, Kenya—Nairobi sells off stakes: Africa Energy Intelligence, no. 364, February 25-March 9, p. 6.

African Energy Journal, 2004, Kenya: African Energy Journal, v. 6, no. 6, November-December, p. 4.

Akumu, Washington, 2004, Portland Cement reports a Sh269m loss: Daily Nation [Nairobi, Kenya], November 11, 2 p.

Brunner Mond Group, 2004, Construction to start on new soda ash plant for Magadi Soda: Brunner Mond Group press release, May 25, 2 p.

Central Bank of Kenya, 2005a, Kenya monthly economic review: Nairobi, Kenya, Central Bank of Kenya, January, 47 p.

Central Bank of Kenya, 2005b, Kenya monthly economic review: Nairobi, Kenya, Central Bank of Kenya, July, 45 p.

Crossley, Penny, 2004, Fluorspar in focus: Industrial Minerals, no. 436, January, p. 26-37.

Daily Nation, 2004, Cement firm's profits up by 69 per cent: Daily Nation [Nairobi, Kenya], March 31, 2 p.

Dana Petroleum plc, 2004, Dana agrees international exploration deal with Woodside: Aberdeen, United Kingdom, Dana Petroleum plc press release, September 28, 4 p.

International Finance Corporation, 2003, Proposed investment in Magadi Soda Ash Limited Company: Washington, DC, International Finance Corporation, October 7, 18 p.

International Iron and Steel Institute, 2004, Steel statistical yearbook 2004: Brussels, Belgium, International Iron and Steel Institute, 111 p.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Metal Bulletin, 2004, [Untitled]: Metal Bulletin, no. 8837, April 12, p. 20.

Mining Journal, 2004, Kenya, *in* Mining annual review 2004: London, United Kingdom, Mining Communications Ltd., CD-ROM.

Mkawale, Steve, 2004, Elders to negotiate mining of red rubies: East African Standard [Nairobi, Kenya], December 29, 1 p.

Oywa, John, and Amadala, Benson, 2004, Gold rush stirs sleepy village: Daily Nation [Nairobi, Kenya], December 20, 4 p.

Digitized by Google

Tiomin Resources Inc., 2004a, Technical report on Kwale: Toronto, Ontario, Canada, Tiomin Resources Inc. press release, August 24, 2 p.
Tiomin Resources Inc., 2004b, Third quarter report for the nine months ended September 30, 2004: Toronto, Ontario, Canada, Tiomin Resources Inc, 12 p.
Wahome, Muna, 2005, ARM to borrow funds: Daily Nation [Nairobi, Kenya], March 30, 2 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Kenya, World Economic Outlook Database, accessed September 19, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/index.htm.

TABLE 1
KENYA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002[e]	2003[e]	2004[e]
Aluminum, secondary[e]		2,400	2,400	2,400	2,400	2,400
Carbon dioxide gas, natural		7,744	5,645	5,662 [3]	5,800 [r]	6,000
Cement, hydraulic	thousand metric tons	1,367	1,319	1,463 [3]	1,658 [r, 3]	1,789 [3]
Clays:						
Bentonite		64	50	50	50	50
Kaolin		793	700	710	730	750
Kyanite		(4)	--	--	--	--
Other		18,000	18,000 [r, e]	18,000	19,000 [r]	19,000
Diatomite		448	441	1,333 [3]	353 [r, 3]	360
Feldspar		82	73	75	75	80
Fluorspar, acid grade[5]		100,102	118,850	85,015 [3]	95,278 [3]	108,000 [3]
Gemstones, precious and semiprecious:						
Amethyst[5]	kilograms	1,107	1,100 [e]	550 [r]	410 [r]	420
Aquamarine[5]	do.	132	130 [e]	70 [r]	50 [r]	50
Cordierite, iolite[5]	do.	280	280 [e]	140 [r]	110 [r]	110
Green garnet	do.	20	25	20 [3]	3 [r, 3]	3
Rhodolite garnet	do.	3,409 [5]	3,400 [e]	1,700 [r]	1,300 [r]	1,300
Ruby	do.	5,896	5,862	3,043 [3]	2,310 [r, 3]	2,400
Sapphire[5]	do.	10,686	10,000 [e]	5,000 [r]	3,800 [r]	3,900
Tourmaline	do.	18,844 [5]	18,000 [e]	9,000 [r]	7,400 [r]	7,600
Gold, mine output, Au content[5]	do.	1,243	1,545	1,477 [3]	1,543 [r, 3]	1,600
Gypsum and anhydrite		8,416	8,200	8,300 [r]	8,600 [r]	8,800
Iron ore		790	920	1,000	1,000	1,000
Lead, refined secondary		1,000	1,000	1,000 [3]	1,000 [3]	1,000 [3]
Lime		1,282	1,300 [e]	1,300	1,400 [r]	1,400
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	2,828	2,329	2,158 [r, 3]	2,200 [r]	2,500
Kerosene and jet fuel	do.	3,175	2,518 [r]	2,148 [r, 3]	2,100 [r]	2,400
Distillate fuel oil	do.	4,531	3,253 [r]	3,021 [r, 3]	3,000 [r]	3,500
Residual fuel oil	do.	3,402	3,563 [r]	3,550 [r, 3]	3,600 [r]	4,200
Liquefied petroleum gas	do.	395	325 [r]	278 [r, 3]	280 [r]	330
Other	do.	134	110 [r, e]	100 [r]	100 [r]	120
Total	do.	14,465	12,100 [r, e]	11,300 [r]	11,300 [r]	13,100
Salt, crude		16,359	5,664	18,848 [3]	21,199 [r, 3]	22,000
Soda ash		238,190	297,780	304,110 [3]	352,560 [3]	355,380 [3]
Stone, sand and gravel:						
Granite for dimension stone		182	180 [r, e]	180 [r]	190 [r]	190
Limestone for cement	thousand metric tons	660 [r, e]	640 [e]	710	800 [r]	860
Limestone for dimension stone	do.	32,000	32,000	32,000 [3]	33,000 [r]	34,000
Marble for dimension stone		116	120 [e]	120	130 [r]	130
Sand, silica[e]		12,000	12,000	12,000 [r]	13,000	13,000
Shale[e]		185,000	190,000	190,000	200,000 [r]	200,000
Sulfuric acid		20,000	20,000	20,000 [3]	20,000 [3]	20,000
Vermiculite		124 [5]	--	-- [3]	--	--

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. -- Zero.
[1]Includes data available through September 19, 2005.
[2]In addition to the commodities listed, a variety of minerals and construction materials [brick clays, coal, gravel, meerschaum, mica, murram (laterite), crushed rock, and construction sand] may be produced, but quantities are not reported, and information is inadequate to make estimates of output.
[3]Reported figure.
[4]Less than 1/2 unit.
[5]Exports.

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TABLE 2
KENYA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Carbon dioxide gas, natural		Carbacid Ltd.	Mine at Kereita	10,000.[e]
Cement		Bamburi Cement Ltd.	Plant at Mombasa	1,100,000.
Do.		do.	Plant at Nairobi	1,000,000.
Do.		East African Portland Cement Co. Ltd.	Plant at Athi River	550,000.
Do.		Athi River Mining Ltd.	Plant at Kaloleni	120,000.
Diatomite		African Diatomite Industries Ltd.	Kariandusi and Soysambu	4,000.
Fluorspar		Kenya Fluorspar Ltd.	Mine at Kerio Valley	132,000.
Glass		Central Glass Industries Ltd.	Plant at Nairobi	51,100.
Do.		Impala Glass Industries Ltd.	do.	NA.
Gold[1]	kilograms	International Gold Exploration AB	Mines at Akala, Lolgorien, and Kisii	155.
Do.	do.	Muungano Gold Prospecting Group	Mines at Lirhembe	NA.
Lead, refined secondary		Associated Battery Manufacturers Co. Ltd.	Plant at Athi River	3,000.
Lime		Athi River Mining Ltd.	Plant at Kaloleni	24,000.
Do.		Homa Lime Company Ltd	Plant at Koru	30,000.
Petroleum, refined	thousand 42 -gallon barrels	Kenya Petroleum Refineries Ltd. [Government, 50%; British Petroleum plc, Caltex Oil (Kenya) Ltd., and Royal Dutch/Shell Group, 50%]	Refinery at Mombasa	32,850.
Ruby	kilograms	Rockland Kenya Ltd.	Mine at Kasigau	1,500.[e]
Salt		Magadi Soda Ash Ltd. (Brunner Mond Group Ltd., 100%)	Mine at Magadi	40,000.
Do.		Krystalline Salt Ltd.	Mine at Nairobi	NA.
Do.		Mombasa Salt Works Ltd.	Mine at Mombasa	NA.
Do.		Salt Manufacturers Kenya Ltd.	do.	NA.
Soda ash		Magadi Soda Ash Ltd.	Mine at Magadi	350,000.
Sodium silicate		Athi River Mining Ltd.	Plants at Athi River and Kaloleni	20,000.
Steel:[2]				
Crude[3]		Kenya United Steel Co. Ltd. (E.A. Wire Industries Ltd., 81%)	Plant at Mombasa	20,000.
Rolled		Mabati Rolling Mills Ltd.	do.	120,000.
Do.		Standard Rolling Mills Ltd.	do.	40,000.
Do.		Kenya United Steel Co. Ltd.	do.	30,000.
Do.		Steelmakers Ltd.	do.	30,000.
Sulfuric acid		East African Heavy Chemicals	Plant at Webuye	NA.
Do.		Kel Chemicals Ltd.	Plant at Thika	NA.
Vermiculite[4]		Kenmag Investments Ltd.	Mine at Lodosoit	2,000.

NA Not available.
[1]Not operational in 2004.
[2]In addition to its crude and rolled steel facilities, Kenya has three galvanized steel plants with a capacity of 210,000 metric tons per year (t/yr).
[3]Has not operated since 1998.
[4]Has not operated since 2000.

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THE MINERAL INDUSTRIES OF LESOTHO AND SWAZILAND

By Philip M. Mobbs

LESOTHO

The Kingdom of Lesotho is a landlocked, independent, parliamentary, constitutional monarchy surrounded by South Africa. In 2004, the economy was based on subsistence agriculture, livestock, and light manufacturing. Historically, repatriated wages from Basotho miners who worked in the South African gold mines have significantly contributed to national income; the number of migrant miners who worked in South Africa, however, decreased to about 58,000 in 2004 from an average of 61,400 in 2003 and about 110,000 in 1994 (International Monetary Fund, 2004, p. 17; Central Bank of Lesotho, 2005, p. S-29).

In 2004, the gross domestic product (GDP) was estimated to be $1.5 billion at current prices; $4.8 billion when calculated at purchasing power parity. The GDP per capita was $2,074 based on purchasing power parity calculations. The country supported an estimated population of 1.86 million people in a 30,350-square-kilometer (km^2) area (U.S. Central Intelligence Agency, 2004§[1]; International Monetary Fund, 2005§).

The country has long been known as a source of diamond, mostly from alluvial deposits; mineral production, however, was not a significant part of the economy. Artisanal miners and small mining companies produced agate, clay, crushed and dimension stone, and sand and gravel for domestic consumption. Operations included the clay pits and the 20-million-brick-per-year-capacity facility of Loti Brick (Pty.) Ltd. and the sandstone quarries of Lekokoaneng Sandstone (Pty.) Ltd., Lesotho Sand Stones Co., and Lesotho Stone Enterprises (Pty.) Ltd. In 2004, the Government's Privatisation Unit was negotiating the privatization of Loti Brick with Semler Holdings Ltd. of Lesotho (United Nations Conference on Trade and Development, 1997, p. 22).

Commodity Review

Industrial Minerals

Diamond.—Letseng Diamonds (Pty.) Ltd. was a joint venture between the Government of Lesotho (24% effective interest) and Letseng Holdings S.A., which was a partnership of Matodzi Resources Ltd. of South Africa (38% effective interest), JCI Limited of South Africa (30%), and Letseng Diamonds Guernsey (Pty.) Ltd. (8%). Letseng Diamonds officially reopened the Letseng la Terae open pit diamond mine in November 2004. The mine, which closed in 1982 because of low diamond prices, was located at about 3,100 meters (m) elevation in the Maluti Mountains in northeastern Lesotho (JCI Limited, undated§).

MineGem Inc. of Canada, which was a subsidiary of European Diamonds PLC of the United Kingdom, held a controlling interest in two locally incorporated companies involved with diamond exploration and development within the Liqhobong kimberlite area—Liqhobong Mining Development Co. (Pty.) Ltd. [which was owned by MineGem (65%), the Government (25%), and the South-African-Government-owned Industrial Development Corp. of South Africa Ltd. (IDC) (10%)] and Maluti Diamonds (Pty.) Ltd. [which was owned by MineGem (90%) and IDC (10%)]. Liqhobong Mining worked the Satellite Pipe mining license, which was located in the northern highlands of Lesotho at about 2,600 m elevation, and Maluti prospected on the adjacent Main Pipe site. Initial production from the Satellite Pipe Mine, which had a grade of 0.69 carat per metric ton, was expected to begin in 2005. Maluti expected to start a feasibility study of the lower-grade Main Pipe in 2005 (European Diamonds PLC, 2004, p. 2-5, 23; 2005§).

In 2004, the proposed rehabilitation of the existing processing plant and a 6-month trial mining program of the Kolo kimberlite by African Diamonds Plc of Ireland faltered when the company requested a mining license and was offered only a prospecting license on the deposit (African Diamonds Plc, 2004, p. 4).

Outlook

With few documented mineral resources, future prospects for mineral development in Lesotho appeared to be limited to the revival of the diamond sector. Diamond mining could become a significant contributor to the economy, but the mining sector's impact on the ravaged labor market of Lesotho would be minimal. In 2005, the mineral sector in Lesotho was expected to employ about 1,000 workers, which would include about 450 at Letseng Diamonds, about 150 at Lesotho Sand Stones, about 150 at Liqhobong Mining, and about 5 at Lekokoaneng Sandstone. During the past 10 years, about 50,000 Basotho miners have lost their jobs owing to the closure of gold mines in South Africa. The loss of mining jobs in South Africa, which temporarily had been reversed in 2002, was exacerbated in 2004 by the strong South African rand. Durban Roodepoort Deep, Ltd.'s Blyvooruitzicht Mine (Blyvoor) alone released 1,169 workers in September. Additionally, in anticipation of the scheduled expiration of the World Trade Organization's Agreement on Textiles and Clothing on January 1, 2005, a number of Lesotho manufacturing operations, especially textile factories, closed their facilities in 2004. These closures resulted in the unemployment of more than 8,000 workers. Unemployment was estimated to be as high as 50%, and more than 30% of the adult population was reported to test positive

[1]References that include a section mark (§) are found in the Internet References Cited sections.

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for the human immunodeficiency virus (HIV) or to have acquired immunodeficiency syndrome (AIDS) (Central Bank of Lesotho, 2004, p. 16; 2005, p. S-29; Durban Roodepoort Deep, Ltd., 2004; European Diamonds PLC, 2005; Apps, 2005§; Reuters, 2005§).

References Cited

African Diamonds Plc, 2004, Annual Report and accounts 2004: Dublin, Ireland, African Diamonds Plc , December 16, 43 p.

Central Bank of Lesotho, 2004, Quarterly Review: Maseru, Lesotho, Central Bank of Lesotho, v. 23, no. 3, September, 51 p.

Central Bank of Lesotho, 2005, Quarterly Review: Maseru, Lesotho, Central Bank of Lesotho, v. 24, no. 1, March, 54 p.

Durban Roodepoort Deep, Ltd., 2004, Blyvoor retrenchment process completed: Johannesburg, South Africa, Durban Roodepoort Deep, Ltd. press release 407/04, October 5, 2 p.

European Diamonds PLC, 2004, Annual report 2004: London, United Kingdom, European Diamonds PLC, December, 32 p.

European Diamonds PLC, 2005, Liqhobong Satellite Pipe production schedule update—Potential mine life extension and additional diamond recovery in tailings: London, United Kingdom, European Diamonds PLC press release, March 17, 2 p.

International Monetary Fund, 2004, Lesotho—Selected issues and statistical appendix: Washington, D.C., International Monetary Fund Country Report No. 04/23, February 5, 95 p.

United Nations Conference on Trade and Development, 1997, Foreign investment in LDCs—Prospects and constraints: Geneva, Switzerland, United Nations Conference on Trade and Development Report UNCTAD/GDS/GFSB/2, June 18, 26 p.

Internet References Cited

Apps, Peter, 2005, April 13, Mine brings hope, accessed June 24, 2005, at URL http://www.jci.co.za/operations/letseng/media_coverage/SowetanLetseng.jpg.

European Diamonds PLC, 2005, 2nd quarter report for the period ended December 31, 2004, accessed June 24, 2005, at URL http://www.europeandiamondsplc.com/i/pdf/2005Q2.pdf.

International Monetary Fund, 2005 (April), Lesotho, World Economic Outlook Database, accessed June 25, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

JCI Limited, [undated], JCI Operation—Letseng, accessed June 24, 2005, via URL http://www.jci.co.za/operations/letseng/default.asp.

Reuters, 2005 (June 22), Fewer Lesotho workers needed in SA gold mines, accessed June 23, 2005, via http://www.miningweekly.co.za.

U.S. Central Intelligence Agency, 2004, Lesotho, World Factbook 2004, accessed June 27, 2005, at URL http://permanent.access.gpo.gov/websites/www.cia.gov/www.cia.gov/cia/publications/factbook/geos/lt.html.

Major Sources of Information

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SWAZILAND

The Kingdom of Swaziland, which is a landlocked country surrounded by South Africa on three sides and by Mozambique to the east, has a surface area of 17,360 km^2 and, in 2004, supported a population of about 1.2 million people. Mining had been an important part of the history of Swaziland but is a minor factor in its present (2004) economy. Anthracite coal was produced at the 888,000-metric-ton-per-year (t/yr)-capacity Maloma Colliery Ltd. where Swazi Vanadium (Pty.) Ltd. also had a 2,400-t/yr-capacity ferrovanadium facility. Brick clay was produced for Fortis Enterprises Ltd., which was expanding the capacity of the Langa Brick factory to 200,000 bricks per day. Gravel, sand, and stone also were produced in Swaziland (Xstrata plc, 2005, p. 158,176; Colin le Roux, Fortis Enterprises Ltd., written commun., June 29, 2005).

The Swazi economy was dominated largely by export-oriented agricultural and related value-added manufacturing production, which was vulnerable to climatic and external demand factors. In 2004, the country's GDP was estimated to be $2.36 billion at current prices and $5.43 billion when calculated at purchasing power parity. The GDP per capita was $4,995 based on purchasing power parity calculations (International Monetary Fund, 2005§).

Trade

In 2003, the last year for which data were available, mineral exports (primarily coal) were valued at nearly $11 million,[2] which represented less than 1% of all merchandise exports. Imports of mineral fuels and lubricants were valued at $156 million, which was equal to about 10% of total imports (Central Bank of Swaziland, 2005§).

Commodity Review

Metals

Ferroalloys.—In 2004, the average price of ferrovanadium rose to $27,200 per ton from $11,500 per ton in 2003 because of continued international demand for use in the production of high-strength and specialty steels. Swazi Vanadium, which was owned by a subsidiary of Xstrata plc of Switzerland (75%) and Tibiyo Taka Ngwane of Swaziland (25%), produced 1,150 metric tons (t) of ferrovanadium, which was an increase from the 1,011 t produced in 2003 (the year in which the plant was commissioned). The plant was located about 8 kilometers southeast of Maloma on the Maloma Colliery's grounds and employed about 15 people. Xstrata's use of coke as a reductant at its ferrovanadium plants in South Africa has diminished in recent years owing to the substitution of Maloma anthracite coal for coke and the increased price of coke imported from China (Tibiyo Taka Ngwane, 2004, p. 31-32; Xstrata plc, 2005, p. 6, 176; Lanham, 2005§).

Mineral Fuels

Coal.—In 2004, the Maloma coal mine produced approximately 683,000 t of anthracite coal compared with

[2]Where necessary, values have been converted from Swazi Langeni (L) to U.S. dollars (US$) at the average rate of L0.1322=US$1.00 for 2003.

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557,000 t in 2003. Coal not used at the adjacent ferrovanadium plant was exported to South Africa. Maloma Colliery, which operated the Maoloma Mine and colliery plant, was owned by Xstrata (75%) and Tibiyo Taka Ngwane (25%) (Xstrata plc, 2005, p. 176).

Outlook

The number of Swazi migrant miners working in South Africa dropped slightly in 2004 to 7,445 compared with 7,885 in 2003 and 20,041 in 1993. The decline in mining employment in South Africa is expected to continue owing to the continuation of a strong rand and weak U.S. dollar. The employment picture in the gold mining sector also could worsen with a decline in international gold prices. Unemployment in Swaziland was estimated to be more than 31%, and more than 38% of the adult population was estimated to test positive for HIV/AIDS. The Swazi labor market (primarily the textile sector) was expected to be affected adversely by the expiration of the Agreement on Textiles and Clothing in January 2005. The Swaziland Investment Promotion Authority (SIPA) campaigned to attract foreign investment. In the mineral sector, SIPA promoted additional development of the clay, coal, and stone segments and the redevelopment of Swaziland's diamond and gold deposits (Central Bank of Swaziland, 2005§; World Bank Group, 2005§).

References Cited

Tibiyo Taka Ngwane, 2004, Annual report 2004: Lozitha, Swaziland, Tibiyo Taka Ngwane, December, 68 p.

Xstrata plc, 2005, Annual report 2004: Zug, Switzerland, Xstrata plc, April, 180 p.

Internet References Cited

Central Bank of Swaziland, 2005 (April), Recent economic developments, accessed June 28, 2005, at URL http://www.centralbank.org.sz/monthly_stats/RECENT-ECONOMIC-DEVELOPMENTS-APRIL-2005.pdf.

International Monetary Fund, 2005 (April), Swaziland, World Economic Outlook Database, accessed June 25, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

Lanham, Andrew, 2005 (June 24), Project Lion adds to Xstrata's pride, accessed June 27, 2005, via URL http://www.miningweekly.co.za.

World Bank Group, 2005, Data query—Swaziland, accessed June 28, 2005, via URL http://devdata.worldbank.org/data-query.

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TABLE 1
LESOTHO AND SWAZILAND: PRODUCTION OF MINERAL COMMODITIES[1]

Country and commodity		2000	2001	2002	2003	2004[e]
LESOTHO[2]						
Fire clay	cubic meters	35,000 [e]	34,000	42,000	14,470	15,000
Diamond	carats	1,500 [e]	1,140	721	2,099	4,000
Stone, quarry products:						
Dimension stone	square meters	12,000	13,357	29,766	1,089	1,000
Gravel and crushed rock	cubic meters	180,000	180,000	261,037	389,695	300,000
SWAZILAND[3,4]						
Asbestos, chrysotile fiber	metric tons	12,690	--	--	--	--
Coal, anthracite	do.	178,043	78,043	313,272	553,422 [r]	550,000
Ferrovanadium[5]	do.	--	--	--	1,011	1,150
Stone, quarry products	thousand cubic meters	304	300	300 [e]	283 [r]	300

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.

[1]Includes data available through June 2005.

[2]Reported data from Lesotho Department of Mines and Geology for the financial year ending in April of the year shown.

[3]Reported data from Central Bank of Swaziland, company reports, or the Swaziland Geological Survey and Mines Department; includes fiscal year data.

[4]In addition to the commodities listed, modest quantities of crude construction materials (brick clay, sand and gravel), kaolin, pyrophyllite (talc), and soapstone are produced, but output is not reported quantitatively, and information is inadequate to make estimates of output levels.

[5]Calendar year data.

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The Mineral Industry of Liberia

By George J. Coakley

The Republic of Liberia is a small West African State with an area slightly larger than Tennessee and a population of less than 3.5 million. In 2004, the country was recovering from a 14-year-long period of civil war and political instability that brought the political system and economic sector of the country to a standstill, claimed the lives of 150,000 people, and forced 850,000 people to seek refuge in neighboring countries. The gross domestic product (GDP) based on purchasing power parity for 2004 was estimated to be $2.9 billion with an estimated real growth rate of 21.8% compared with 5.8% in 2003. The GDP per capita was estimated to be $900. The inflation rate was estimated to be 15% in 2003, the latest available year in this time series (U.S. Central Intelligence Agency, 2005§[1]).

By early 2005, more than a third of the total population of Liberia lived in and around the capital Monrovia where unemployment was estimated to be at 85%. There was no running water or electricity in the capital. On August 18, 2003, a Comprehensive Peace Agreement was signed in Accra, Ghana, by the main warring factions: Liberians United for Reconciliation and Democracy (LURD), the Movement for Democracy in Liberia (Model), and the existing Government of Liberia, which was formerly led by the exiled Charles Taylor. The Agreement declared an immediate end to the war and established a National Transitional Government of Liberia (NTGL) whose primary responsibility was to implement the peace treaty and to prepare for national elections in October 2005; the elected government was to assume power in January 2006. On September 19, 2003, the United Nations Security Council (UNSC) adopted resolution 1509 (2003) that established the United Nations Mission in Liberia (UNMIL). The UNMIL mandate called for a peacekeeping force of up to 15,000 United Nations (UN) military personnel and empowered UNMIL for an initial period of 12 months; the UNSC renewed the UNMIL mandate on September 19, 2004, for an additional year. UNMIL has taken the lead in an international effort to implement the Liberian cease-fire agreement, assist in the maintenance of law and order throughout Liberia, and help restore the country's political and economic self-sufficiency (United Nations, 2004b§). The fifth progress report of the UN Secretary-General on the UNMIL was issued in December 2004 (United Nations, 2004a§).

Also in December, the UN adopted Resolution 1579, which renewed the sanctions on arms acquisition, timber sales, and official Government travel for an additional 12 months (subject to a review after 6 months); the ban on the sale of rough diamond was renewed for 6 months (to be reviewed after 3 months). Resolution 1579 also reestablished the UN Panel of Experts on Liberia until June 21, 2005, to investigate and report back to the UNSC on the implementation of the sanctions and on any violations (United Nations, 2004e§). The UN Panel of Experts submitted interim and final reports of its findings in September and December 2004, which, among other items, noted that the NTGL still "lacked the functional capacity to control illegal diamond mining" (United Nations, 2004c§, d§). Illegally extracted "conflict" diamond and timber had helped fund the prolonged civil war and thus were a key focus of the sanctions. Efforts by the NTGL, with assistance from the international donor community, to establish "security, transparency and accountability" in the diamond and timber sectors was a prerequisite for the lifting of sanctions against the export of these commodities.

In November 2002, about 50 countries that produce, trade, and process diamond became signatories to the Kimberley Process Certification System (KPCS) aimed at establishing a system of certificates of origin to control the global trade in diamond. The treaty resulted from international concern over the growing evidence of illegally mined and exported diamond revenues being used to support civil conflicts in Angola, Sierra Leone, and elsewhere (Kimberley Process Secretariat, 2004§). The NTGL was encouraged by the UNSC to establish a Certificate of Country of Origin regime that is transparent, effective, and internationally verifiable for the trade in rough diamond, with a view to joining the Kimberley Process Certification Scheme. The NTGL requested that a Kimberley Process Review Team visit Liberia in February 2005 to assess the NTGL's ability to comply with the requirements of the KPCS.

Liberia was a producer of cement, diamond, and gold and, historically, was a major iron ore producer. To help enforce UN sanctions on diamond exports, the Ministry of Lands, Mines and Energy banned all diamond mining as of January 2005, although exploration was still permitted.

Legislation and Government Regulations

On November 17, 2004, the Government enacted a new Chapter 40 of the New Minerals and Mining Law, Part I, Section 23, of the Liberian Code of Laws Revised (2000). Chapter 40 provides for controls on the export, import, and transit of rough diamond and puts in place the legal framework for Liberia to participate in the KPCS. The New Mining Law of 2000, which is administered by the Ministry of Lands, Mines and Energy, has a clearly defined exploration and licensing system, as follows:

- Exploration Licenses—These licenses are issued to exploration and mining companies for 3 years and are renewable for an additional 3 years, during which time artisanal miners may continue to work on the land under their individual licenses. After each 3-year period, one-half of the exploration claim must be relinquished.
- Class A Mining Licenses—Under a Class A license, concessions are limited to 1,000 square kilometers (km^2) and are open to foreign ownership. Concessions are valid for up to 25 years and are renewable for consecutive additional terms of up

[1]References that include a section mark (§) are found in the Internet References Cited section.

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to 25 years each upon a showing of proven reserves. Class A license holders are required to enter into a Mineral Development Agreement with the Government and to pay land rent, taxes, and royalties. Mineral Development Agreements are subject to review every 5 years to take into consideration "substantial changes in circumstances." Royalties for diamond range from 3% to 10% of the appraised value, with periodic reviews by the Ministry of Lands, Mines and Energy to reassess the royalty rate. Royalties are paid directly to the Ministry of Finance.

- Class B Mining Licenses—Under a Class B license, concessions are granted for an initial term of 5 years, and are renewable for consecutive periods of up to 5 years more. Mechanized "industrial" mining operations (backhoe excavators, suction pumps, etc.) are permissible under this license. Foreign ownership is allowed.
- Class C Mining Licenses—Issuances of Class C licenses have been the key regulatory control mechanism over artisanal mining. Concessions are granted for a 1-year period, and all expire on December 31st of each year. A license fee of $350 per claim is required. Only Liberian nationals are eligible for Class C licenses. Class C claim areas are limited to 25 acres and are restricted to semimechanized artisanal mining—generally a "shovel and digger" operation. Several Class C licenses may be combined to apply for a Class B license. The Government placed a moratorium on artisanal mining in January 2005 and announced that no Class C licenses would be issued during 2005.

Commodity Review

Metals

Gold.—AmLib United Minerals, Inc. of the United States was actively exploring for gold on a 1,300 km^2 license area that included the Cestos, Kle-Kle, and Zwedru properties in Bong, Grand, and River Cess Counties. During 2004, AmLib applied for a Mineral Development Agreement on its Kokoyo property in Bong County in the central part of the country, where it planned to conduct a pre-feasibility study during 2005. The company was privately held and details of its work were not publicly available (AmLib United Minerals, Inc., 2004§).

Resources, Inc. of the United Kingdom held a Mineral Development Agreement that covered a 1,000-km^2 concession in the Bea Mountains in western Liberia, where diamond-drilling, geochemical, and geologic exploration has been carried out on the Gondoja, King George Larjor (KGL), and Weaju gold properties; the company had identified four other gold prospects at Benjeh, Butler Hill, Ndablama, and Sosa Camp. The KGL property is on the site of major artisanal alluvial workings, and exploration has identified primary gold mineralization in sheared ultramafic komatiitic schists within the regional Archean greenstone belt. Mano River Resources has estimated the indicated resource at KGL to be 1.1 million metric tons (Mt) at a grade of 5.23 grams per metric ton (g/t) gold and the inferred resource to be 2.2 Mt at a grade of 5.1 g/t gold. Mano River Resources was awaiting the delivery of three diamond drills by February 2005 to continue exploration along the 70-kilometer (km)-long shear zone within its concession. Mano River Resources also had active gold and diamond exploration projects in neighboring Guinea and Sierra Leone (Mano River Resources, Inc. 2005a§, c§).

In April 2004, Diamond Fields International Ltd. acquired the 1,300-km^2 Cestos gold concession, which is located in River Cess and Sinoe Counties near the Cestos shear zone. On August 12, 2004, Diamond Fields signed an option agreement with Liberian-owned Ducor Minerals Inc., which entitled Diamond Fields to earn an interest in Ducor's legal rights under two Mineral Exploration Agreements between Ducor and the Government of Liberia. The Gbapolu (Grand Cape) diamond concession and the Grand Gedeh gold properties cover a combined area of more than 1,800 km^2. The option agreement allowed for Diamond Fields to earn a 70% interest in Ducor in return for 1 million shares of Diamond Fields stock, provided Diamond Fields spends $2 million on exploration over the next 4 years. Soil and stream sediment sampling for gold was continuing into 2005 on the Grand Gedeh property (Diamond Fields International Ltd., 2004§, 2005b§).

Iron Ore.—With the increasing world demand for iron ore that has been driven by the rapid growth of the Chinese steel industry, the mining industry was actively seeking new sources of iron ore supply. Many of these potential new sources, such as in Liberia and Guinea, have been known for a long time, but have been either unavailable or marginally economic owing to their low grade or high infrastructure development costs. A 1988 United Nations University study estimated Liberia's iron ore resources to be between 2 billion and 5 billion metric tons (Yachir, 1988§). Table 3 shows recent Ministry of Lands, Mines and Energy estimates of iron ore resources by deposit. In January 2005, the Ministry of Lands, Mines and Energy announced that four multinational companies had submitted bids to reopen the iron ore mines in the Nimba Mountains. The four companies were BHP Billiton plc, Global Infrastructure Holdings (the holding company for two Indian steel companies, Ispat and Essar), Mittal Steel, and Rio Tinto plc (Africa Online, 2005§).

Iron ore has been mined in Liberia since the early 1950s. The iron ore deposits of Liberia are Archaean age iron formations of itabirite type and are associated with metavolcano-sedimentary formations overlying and tightly infolded into the predominantly gneissic basement complex. After the opening of the Buchanan Port in 1963, iron ore production and exports ranged between 12 Mt/yr and 24 Mt/yr during the period 1964 to 1989, which was the last year of any significant production; the iron ore mine at Nimba finally closed in 1991. By the time of closure, most of the high grade (greater than 60% iron content) iron ore at the Nimba Mine, which was operated by American and Swedish interests, had been mined out. There are, however, extensive known resources of lower grade iron ore in northern Liberia, including the deeper ores at Nimba and the nearby Mount Todeh deposit, at Mt. Kitoma, at Wologisi, and in the Putu Mountains. The Nimba-Buchanan railway was built to export the Nimba iron ore and, in addition to iron ore handling facilities at Buchanan, there was a 10-Mt/yr washing plant and a 2-Mt/yr pelletizing plant. In addition to Nimba, iron ore was mined at the National Iron Ore Company Mine near Mano River by the

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Liberia Mining Company of the United States in the Bomi Hills and by German and Italian steel interests in the Bong Range. The Liberian Government held minority equity interest in both the Bong and the Nimba Mines. Around 1980, a pelletizing plant was added to the Bong operation to upgrade lower grade ores for export. All these iron ore handling and treatment facilities have been destroyed and would need to be rebuilt to support any future iron ore mining.

Industrial Minerals

Cement.—Liberian Cement Corp. operated a cement plant with a capacity of 220,000 metric tons per year (t/yr). Post-war reconstruction efforts will substantially increase the internal demand for cement. The increasing cost of domestically produced cement has led the NTGL to allow imported cement into the market to increase competition (Liberia Analyst Corp., 2005§). Foreign investment was being sought to build additional cement production capacity in the country.

Diamond.—Diamond occurs in two principal areas in Liberia—in alluvial terrace gravels in the Gbapa area, which is located about 35 km south of Nimba and Yekeba on the northern border with Guinea, and within a large (approximately 60-km-wide and 120-km-long) area roughly between the Lofa River and the Mano and Morro Rivers along the western border with Sierra Leone. The latter area encompasses the Liberian counties of Gbarpolu, Grand Cape Mount, and Lofa. This region is part of the Mano Craton of West Africa, which is a northeasterly trending geologic structure that generally follows the same trend as the local watersheds, such as the Lofa and Mano Rivers. The Mano Craton contains the principal diamond-bearing rocks, generally of Jurassic Age (130 to 150 million years old), of Guinea, Liberia, and Sierra Leone. The kimberlites in the Weasua area, however, have been dated at 800 million years old.

All diamond production in Liberia comes from artisanal alluvial mining. Between 1960 and 1980, official production and export statistics of Liberia ranged from 300,000 to 900,000 carats per year. During much of this period, however, Liberia was a U.S. dollar currency zone, and it is suspected that the statistical data included diamond from neighboring countries that was taken across the border in search of the harder currency available in Liberia. Liberian production data for the 1980-90 period of 100,000 to 430,000 carats per year is probably more reflective of Liberian domestic artisanal mining productive capacity. Historical diamond export data are shown in table 2. In the few months of 2001 before the sanctions on diamond from Liberia were imposed by UNSC Resolution 1343 (2001), Liberia officially exported 3,781 carats of rough diamond. Since then, no diamond has been exported. UN sanctions and Kimberley Process restrictions have shut down the artisanal mining of diamond. However, under new legislation, once sanctions are lifted, the Government has mandated the formation of artisanal cooperatives similar to those that are in place in Sierra Leone.

According to the November 2004 UN Panel of Experts report on Liberia, a large Class B alluvial diamond mine that employed 150 workers and was owned by Jungle Waters was operating in the Gbapa-Nimba County area. Following a cave-in that cost the lives of several diggers in November 2004, the mine was closed by the Ministry of Lands, Mines and Energy. The UN Panel of Experts also reported seeing evidence of 16 medium-scale alluvial mines chiefly between the Lofa Bridge and Wesua (United Nations, 2004d§).

The ban on new mining licenses and on diamond prospecting has limited the work of the two main international exploration companies in Liberia, Mano River Resources and Diamond Fields. Some exploration work, however, was allowed to continue under terms of the Mineral Development Agreements. Diamond Fields held a 100% interest in the Nimba concession and an option agreement with Ducor on Docor's Gbapolu concession in Grand Cape County. In March 2005, Diamond Fields announced that recent loam and stream sediment sampling had identified five priority kimberlitic targets within the Grand Cape concession (Diamond Fields International Ltd., 2005a§).

Mano River Resources holds a 25-year Mineral Development Agreement for 200 km^2 on the Kpo Range area of the Bea Mountains in Grand Cape County. Under a joint-venture agreement with the Trans Hex Group of South Africa, the companies had discovered a number of kimberlites with a focus on the Mano Godua and Mabong and Yambessi Valleys sites. Mano River Resources reported that "Trans Hex can earn a 50% interest in the Kpo license by investing US$2.1 million in a two-phase 3-year program. Thereafter, Mano River Resources can maintain its contributing interest at 50% or offer Trans Hex the opportunity to increase its equity to 69% by funding feasibility and construction" (Mano River Resources, Inc., 2005b§). As of January 2005, Mano River Resources had discovered five kimberlite pipes in the Weasua area of the Kpo license. Three of these pipes were confirmed by test work at Lakefield laboratory in Toronto as diamondiferous and two were estimated to have substantial surface areas of approximately 4 hectares. In addition, numerous high interest indicator mineral anomalies in the Weasua area remained unresolved, which indicated that additional pipes may remain to be discovered in the cluster (Mano River Resources, Inc., 2005b§). Mano River Resources assisted the Ministry of Lands, Mines and Energy by establishing a heavy-mineral sample preparation lab at the Liberian Geological Survey offices in Monrovia.

American Mining Associates (an American-owned company) also held an exploration license for diamond north of Lofa Bridge in Grand Cape County.

Mineral Fuels

In 2003 (the last year for which data were available) Liberia did not produce or refine petroleum and was dependent upon imports for its petroleum requirements. Imports of petroleum products amounted to about $25 million, or 17% of total imports (International Monetary Fund, 2004§, p. 26).

Infrastructure

Liberia had more than 10,600 km of highways, of which 657 km was paved. Neglect, however, and damage during the civil war has left many roads difficult to travel on. Reconstruction

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efforts have focused on the routes between the main cities and on those needed to repatriate refugees. Liberia has four main ports, at Buchanan, Greenville, Harper, and Monrovia. The Ports of Buchanan, Greenville, and Harper are used primarily for the logging trade, while Buchanan was traditionally used for rubber and iron ore exports. Water depth at the harbor at Buchanan limits the size of ships that can berth. Dredging would likely be needed to accommodate large world-class iron ore carriers should the Liberian iron ore industry be revitalized.

Liberia had a total of 490 km of rail that runs from Monrovia to the closed iron ore mine at Bong, and from the Port of Buchanan to Yekepa and the former Nimba iron ore mine. The Bong line (145 km, narrow gauge) had been restored, partially to accommodate the export of scrap iron from the old Bong iron ore plants. Plans to rebuild the Buchanan-Yekepa line (345 km, standard gauge) would be enhanced by the potential opening of iron ore mines in northern Liberia and at Mifergui in Guinea. The Buchanan line would be the natural and most likely the cheapest export route for the high-grade iron ore deposits at Mifergui. Consideration was also being given to building a new and considerably longer railway from Mifergui to Conakry that would stay entirely within Guinea. Lack of regional cooperation and long periods of political instability have made it difficult to optimize regional infrastructure projects (OT Africa Line, 2005§; U.S. Central Intelligence Agency, 2005§).

Outlook

With the signing of the Peace Agreement in 2003 and with assistance from the UN and the international donor community, 2004 saw the beginning of the long process of rebuilding the Liberian economy, for which mining development is poised to play a large part. Rehabilitation of the iron ore sector and the potential for developing the country's diamond and gold resources hold the promise for the creation of employment and foreign exchange export earnings. The ability of Liberia to reestablish self-governance following the October 2005 elections and to create a stable and transparent investment climate will determine the rate at which the required direct foreign investment in mineral development will flow into the country.

Internet References Cited

Africa Online, 2005 (January 16), Liberia—Four multinationals bid to reopen Nimba iron ore mines, accessed July 8, 2005, at URL http://www.africaonline.com/index.php?mode= getarticle&itemNo=9018068.

AmLib United Minerals, Inc., 2004, AmLib United Minerals, accessed July 7, 2005, at URL http://www.amlib.com.

Diamond Fields International Ltd., 2004, Annual report 2004 (for year ending June 30, 2004), accessed July 7, 2005, at URL http://www.diamondfields.com/i/pdf/2004AR.pdf.

Diamond Fields International Ltd., 2005a (March 29), Diamond Fields announces five additional priority kimberlite targets in the Grand Cape diamond prospect, News Release, accessed July 7, 2005, at URL http://www.diamondfields.com/s/NewsReleases.asp.

Diamond Fields International Ltd., 2005b (February 15), Second quarter report 2005 (for quarter ending December 31, 2004), accessed July 7, 2005, at URL http://www.diamondfields.com/s/FinancialStatements.asp.

International Monetary Fund, 2004 (December 14), Liberia—Report on post-conflict economic conditions and economic problems for 2004/05—staff report; staff statement; public information notice on the executive board discussion; and statement by the Executive Director for Liberia: IMF Country Report No. 04/40815, accessed July 7, 2005, at URL http://www.imf.org/external/pubs/cat/longres.cfm?sk=17917.0.

Kimberley Process Secretariat, 2004, Kimberley Process, accessed June 1, 2005, at URL http://www.kimberleyprocess.com/contact.asp.

Liberia Analyst Corp., 2005 (January 11), Handle the cement issue legally, The Analyst (Monrovia, Liberia), accessed July 8, 2005, at URL http://www.analystnewspaper.com/Memo_Jan_11_2005.htm.

Mano River Resources, Inc., 2005c, Projects—Gold—Liberia, accessed July 7, 2005, at URL http://www.manoriver.com/s/LiberiaOverview.asp.

Mano River Resources, Inc., 2005b (January 17), Mano River and Trans Hex commence joint venture on diamond-bearing kimberlite pipes in Liberia, accessed July 7, 2005, at URL http://www.manoriver.com/s/NewsReleases.asp?page=2.

Mano River Resources, Inc., 2005a (June 3), Management discussion and analysis of accounts for the year ended January 31, 2005, Press Release, accessed July 7, 2005, at URL http://www.manoriver.com/s/NewsReleases.asp?ReportID=108918&_Type=&_Title=Publication-of-Year-End-2005-Accounts.

OT Africa Line, 2005, Liberia—Port infrastructure, accessed July 8, 2005, at URL http://www.otal.com/liberia.

United Nations, 2004a (December 17), Fifth progress report of the Secretary-General on the UN mission in Liberia, S/2004/972, accessed July 6, 2005, at URL http://daccessdds.un.org/doc/UNDOC/GEN/N04/645/85/PDF/N0464585.pdf?OpenElement.

United Nations, 2004b, History—United Nations mission in Liberia, accessed June 1, 2005, at URL http://www.unmil.org/content.asp?cat=history.

United Nations, 2004c (September 24), Letter dated 13 September 2004 from the Chairman of the Panel of Experts on Liberia addressed to the Chairman of the Security Council Committee established pursuant to resolution 1521 (2003) concerning Liberia, S/2004/752, accessed July 7, 2005, at URL http://www.reliefweb.int/library/documents/2004/unsc-lbr-24sep.pdf.

United Nations, 2004d (December 6), Report of the Panel of Experts pursuant to paragraph 2 of Security Council resolution 1549 (2004) concerning Liberia, S/2004/955, accessed July 7, 2005, at URL http://www.reliefweb.int/library/documents/2004/unsc-lbr-06dec.pdf.

United Nations, 2004e (December 21), Security Council renews Liberia sanctions on arms, travel, timber, diamonds, unanimously adopting Resolution 1579 (2004), Press Release, accessed July 6, 2005, at URL http://www.un.org/News/Press/docs/2004/sc8275.doc.htm.

U.S. Central Intelligence Agency, 2005, Liberia, World Factbook 2005, accessed July 8, 2005, at URL http://www.cia.gov/cia/publications/factbook/geos/li.html.

Yachir, Faysal, 1988, Chapter 2—Africa in world mining geography, *in* Mining in Africa Today—Strategies and Prospects, accessed July 8, 2005, at URL http://www.unu.edu/unupress/unupbooks/uu29me/uu29me00.htm#Contents.

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TABLE 1
LIBERIA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		2000	2001	2002	2003	2004
Cement, hydraulic	metric tons	71,000	62,897	53,622	25,000 [e]	40,000 [e]
Diamond[e]	carats	170,000	170,000	80,000	40,000	10,000
Gold[e]	kilograms	25	57	42	20	20

[e]Estimated; estimated data are rounded to no more than three significant digits.
[1]Table includes data available through July 10, 2005.

TABLE 2
LIBERIA: EXPORTS OF ROUGH DIAMOND FROM 1953 TO 2004

Year	Carats	Year	Carats	Year	Carats
1953	1,200	1970	812,000	1987	295,000
1954	19,300	1971	809,000	1988	167,000
1955	170,700	1972	764,000	1989	150,000
1956	718,100	1973	817,000	1990	NA
1957	NA	1974	634,000	1991	NA
1958	NA	1975	405,000	1992	NA
1959	1,114	1976	320,000	1993	NA
1960	942,100	1977	326,000	1994	NA
1961	1,081	1978	328,000	1995	NA
1962	904,700	1979	301,000	1996	NA
1963	747,400	1980	298,000	1997	NA
1964	680,000	1981	314,000	1998	8,047
1965	545,000	1982	403,000	1999	7,482
1966	555,000	1983	323,000	2000	18,300
1967	543,000	1984	240,000	2001	3,781
1968	750,000	1984	240,000	2002	--
1968	750,000	1985	138,000	2003	--
1969	760,000	1986	252,000	2004	--

NA Not available. -- Zero.

Source: Liberia Ministry of Lands, Mines & Energy, 2004

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TABLE 3
LIBERIA: ESTIMATED RESERVES OF IRON ORE IN 2004[1]

Deposit	Location	Duration of prior mining	Company	Type of ore	Reserves (million metric tons)	Ore grade (% Fe)
Mt. Nimba[2]	Yekepa, about 340 kilometers east-northeast of Monrovia	1963-1983	Liberian American-Swedish Minerals Co., Joint Venture Operating Co. (LAMCO)	Hematitic itabirite	417	65-69
Do.	do.	Jan-Mar 1990	Iron Mining Co. of Liberia (LIMINCO)	do.	417	65-69
Mt. Nimba Western Area[3]	do.	1963-1983	Liberian American-Swedish Minerals Co., Joint Venture Operating Co. (LAMCO)	Magnetitic itabirite	NA	52
Do.	do.	Jan-Mar 1990	Iron Mining Co. of Liberia (LIMINCO)	do.	NA	52
Bomi Hills	80 kilometers northwest of Monrovia	1951-1977	Liberian Mining Co. Ltd.	Magnetite	45	68
Mano River	Mano River Hills, near Sierra Leone border	1958-1983	National Iron Ore Co. Ltd.	Limonitic	136	51
Bong Mine	80 kilometers northeast of Monrovia	1965-1990	Bong Mining Co.	Magnetite	290	35-45
Putu Range	Grand Gedeh County, 270 kilometers east-southeast of Monrovia	Undeveloped	do.	Itabirite	455	45
Bea Mountain	Grand Cape Mount County	Undeveloped	Liberian Mining Co. Ltd.	Magnetite, hematite, and goethite	382	35-45
Wologizi Range	Lofa County	Undeveloped	Liberian Iron Ore and Steel Co. Exploration	Hematite	1,000	35-40
Goe Fantro	60 kilometers northeast of Monrovia	Undeveloped	Liberian American-Swedish Minerals Co., Joint Venture Operating Co. (LAMCO)/Iron Mining Co. of Liberia (LIMINCO)	do.	NA	35-40

NA Not available.

[1]Source: Liberian Ministry of Land, Mines & Energy, Liberia: Resource Potential and Investment Opportunities. Presentation to INDABA-Africa Mining Investment Conference, Cape Town, South Africa, February 2005.

[2]Includes Gbahm Ridge, Mt. Nimba, and Mt. Tokadeh. Much of the high grade ore was mined out by Liberian American-Swedish Minerals Co.

[3]Includes Mount Bele, Mount Kitoma, and Yulleton deposits

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THE MINERAL INDUSTRY OF LIBYA

By Philip M. Mobbs

Libya's mineral and mineral-based commodity production included ammonia, cement, clay, dolomite, gypsum, limestone, lime, methanol, natural gas, petroleum, salt, sand, steel, stone, sulfur, and urea. Production of crude oil and natural gas, while of regional importance, has languished; oil production in 2004 was less than one-half of the volume that was produced in 1970. The oil sector had been adversely affected by sanctions initially imposed on Libya by the United States (U.S.) Government in the 1980s.

Libya was the 3d leading crude oil producer in Africa after Nigeria and Algeria, and the 16th leading oil producer in the world. Most of the produced oil was exported. International demand for oil and interest in funding natural gas collection and transportation infrastructure, coupled with the termination of economic sanctions by the United States in 2004 and the United Nations in 2003, were expected to revive the Libyan hydrocarbon sector. In 2004, the nation's natural gas reserves were about 1.5 trillion cubic meters, which ranked Libya fourth in Africa after Algeria, Nigeria, and Egypt. Libya's proven oil reserves were about 39.1 billion barrels, which were the largest on the African continent and which ranked the country ninth in the world in proven oil reserves (BP p.l.c., 2005, p. 4, 6, 20).

According to the International Monetary Fund (2005§[1]), the gross domestic product (GDP) based on purchasing power parity was estimated to be $61 billion in 2004 and the GDP per capita based on purchasing power parity was $10,769. In 2003 (the last year for which data were available), 61.2% of the nominal GDP at factor cost was attributed to oil production and 1.1% was credited to mining. Natural gas and oil accounted for 96.6% of the value of total exports and 85.6% of Government revenue. About 2.7% of the labor force was engaged in oil and gas production, and 2%, in mining and quarrying (Elhage and others, 2005, p. 4, 6, 11, 22).

Government Policies and Programs

In 2004, the Government reestablished the Ministry of Energy. The National Oil Co. of Libya (NOC) had been in charge of the country's hydrocarbon sector since 2000, when the Ministry was originally abolished. NOC unveiled a new production-sharing agreement for the eight exploration blocks offered for licensing in 2004. Most licenses issued previously under the 1955 hydrocarbon law had been awarded after direct negotiations between the oil companies and the NOC.

In February, the U.S. Government authorized organizations that had retained rights to presanction operations in Libya (such as the oil concessions of the Oasis Group and Occidental Petroleum Corp.) to negotiate their return to Libya. In April, the U.S. Government eased sanctions, which lifted travel restrictions and authorized the purchase of crude oil from Libya and, in September, rescinded most of its remaining trade sanctions on Libya and authorized the importation of petroleum products refined in Libya (Newcomb, 2004; U.S. Office of Foreign Assets Control, 2004).

Commodity Review

Industrial Minerals

Cement.—Construction of the 4,200-metric-ton-per-day (t/d)-capacity cement clinker plant for the Arab Union Contracting Co. was completed in 2004. Commissioning began in December and commercial production was expected to begin in mid-2005 (FLSmidth A/S, 2005§).

Mineral Fuels

Natural Gas.—Most natural gas production in Libya was associated with crude oil production. In October, Eni S.p.A. of Italy and NOC began initial production from the Wafa Field, which was located in onshore Block NC-169A, and began natural gas shipments through Greenstream pipeline to Gela, Sicily, from Mellitah, Libya. Additional gas was to be supplied to the Greenstream pipeline from the Bahr Essalam Field, which was located in offshore Block NC-41, where production was expected to begin in 2005 (U.S. Securities and Exchange Commission, 2005, p. 21).

The development of the Bahr Essalam and the Wafa Fields, which were part of Eni's Western Libya Gas Project, and the development of the natural gas export pipeline represented a shift in Libyan Government emphasis from oilfield development to a mix of natural gas and oilfield projects. Previously, natural gas exports had been limited to exports of liquefied natural gas (LNG). The sole LNG plant at Marsa el Brega, which was operated by Sirte Oil Co. for Production and Processing of Oil and Gas, processed about 900 million cubic meters per year, or about 700,000 metric tons per year, of natural gas (Mena Report, 2005§).

Petroleum.—In January, production began from the Elephant Field onshore Block NC-174 in the Murzuq Basin. Eni S.p.A. of Italy (33.3% equity interest) operated the field for joint-venture partners NOC (33.3%), Korea National Oil Co. (16.67%), SK Corp of Korea (8.33%), Majuko Enterprise, Ltd. of Korea (5%), and Daesung Industrial Co. Ltd. of Korea (3.3%). The field was expected to produce 150,000 barrels per day when fully operational in 2007 (U.S. Securities and Exchange Commission, 2005, p. 21).

In June, a Repsol YPF-operated joint venture, which included Norsk Hydro ASA of Norway, OMV AG of Austria, and Total S.A. of France, began production from the D Field on Block

[1]References that include a section mark (§) are found in the Internet References Cited section.

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NC-186. The joint venture had initiated production from the A Field on the same block in 2003.

At yearend, Az Zawiya Oil Refinery Co. continued negotiations with Uhde GmbH of Germany on the long-proposed upgrade of the Az Zawiya refinery.

References Cited

BP p.l.c., 2005, Statistical review of world energy: London, United Kingdom, BP p.l.c., June, 41 p.

Elhage, M., Abdoum, R., Bailen, J., and Farhan, N., 2005, Socialist People's Libyan Arab Jamahiriya—Statistical appendix: Washington, D.C., International Monetary Fund Country Report no. 05/78, March 8, 46 p.

Newcomb, R.R., 2004, Libyan sanctions regulations—31 CFR Part 550—General license: Washington, D.C., U.S. Department of the Treasury, April 23, 2 p.

U.S. Office of Foreign Assets Control, 2004, What you need to know about the U.S. embargo: Washington, D.C., U.S. Department of the Treasury, September 20, 1 p.

U.S. Securities and Exchange Commission, 2005, Form 20-F—Eni S.p.A.: Washington, D.C., U.S. Securities and Exchange Commission, 153 p.

Internet References Cited

FLSmidth A/S, 2005, AUCC—First FLS project in Libya, accessed August 29, 2005, at URL http://www.flsmidth.com/flsmidth/english/product/projects/cases/aucc+libya+/first+fls+project+in+libya.htm.

International Monetary Fund, 2005 (April), Libya, World Economic Outlook Database, accessed May 3, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

Mena Report, 2005 (May 3), Libya National Oil Corporation—Shell reach agreement, accessed September 20, 2005, http://www.menareport.com/en/business,Oil_and_Energy/183090.

TABLE 1
LIBYA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004[e]
Cement, hydraulic[e]		3,000	3,000	3,300	3,300	3,500
Gas, natural:						
Gross	million cubic meters	11,000	11,500 r	11,100 r	10,300 r	11,000
Dry	do.	5,900 r	6,200 r	6,200 r	6,400 r	7,000
Gypsum[e]		175	150	150	150	175
Iron and steel, metal:						
Direct-reduced iron[3]		1,500	1,090	1,170	1,340	1,580 [4]
Crude steel		1,055	846	886	1,007 r	1,026 [4]
Lime[e]		270	250	250	250	250
Methanol		685	570	680	727	730
Nitrogen:						
N content of ammonia		552	495	533	577	577
N content of urea		407	365	400	425	425
Petroleum:						
Crude[e]	thousand 42-gallon barrels	538,000	520,000	502,000	543,000	587,000
Refinery products:[4]						
Liquefied petroleum gas	do.	1,800	1,900	1,400	2,300	2,300
Gasoline	do.	6,500 r	6,500 r	6,100 r	7,300 r	7,300
Naptha	do.	21,700	19,900	19,300	21,200	21,200
Kerosene and jet fuel	do.	12,100 r	12,000 r	11,800 r	12,400 r	12,400
Distillate fuel oil	do.	29,800 r	27,900 r	25,000 r	28,100 r	28,100
Residual fuel oil	do.	46,900 r	40,300 r	39,200 r	41,600 r	41,600
Total	do.	118,800 r	108,500 r	102,800 r	112,900 r	113,000
Salt[e]		40	40	40	40	40
Sulfur, byproduct of petroleum and natural gas[e]		13	15	15	15	15

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised.

[1]Table includes data available through August 2005.

[2]In addition to the commodities listed, a variety of clay, dolomite, limestone, sand, and crushed construction stone was produced, and natron (soda ash) may have been produced, but available information is inadequate to make estimates of output levels. Natural gas liquids also were produced but were blended with crude petroleum and reported as part of that total.

[3]Includes hot-briquetted iron.

[4]Reported figure.

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TABLE 2
LIBYA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement:		Libyan Cement Co. (Government)	Benghazi	1,500
Do.		Arab Union Contracting Co.	Zliten	1,200 [1]
Do.		Arab Cement Co. (Government)	Homs 2, Lebda	1,000
Do.		do.	Souk el Khamis, Tripoli	1,000
Do.		do.	Zliten	1,000
Do.		Libyan Cement Co. (Government)	El Fataih, Derna	1,000
Do.		do.	El Hawari	400
Do.		Arab Cement Co. (Government)	Homs 1, El Margueb	300
Iron and steel:				
Iron:				
Hot briquetted iron		Libyan Iron and Steel Co. (Government)	Misurata	650
Sponge iron		do.	do.	1,100
Steel:				
Crude		do.	do.	1,250
Rolled:				
Bar and rod		do.	do.	800
Cold-rolled srip		do.	do.	140
Hot-rolled strip		do.	do.	580
Methanol		Sirte Oil Co. for Production and Processing of Oil and Gas (National Oil Co. of Libya)	Marsa el Brega	365
Natural gas, liquefied		do.	do.	700
Nitrogen:				
Ammonia		do.	do.	803
Urea		do.	do.	1,041
Petroleum:				
Crude	thousand 42-gallon barrels per day	National Oil Co. of Libya in joint venture or under production-sharing agreements with Agip Oil Co. Ltd., Norsk Hydro ASA, OMV AG, Petro-Canada, Repsol YPF, Total S.A., and Wintershall AG; and subsidiary companies of National Oil Co. of Libya, which included Arabian Gulf Oil Co., Sirte Oil Co. for Production and Processing of Oil and Gas, Waha Oil Co., and Zueitina Oil Co.	Cyrenaica, Ghadames, Murzuq, and Sirte basins and offshore	1,609
Refined	do.	Ras Lanuf Oil and Gas Processing Co. (National Oil Co. of Libya)	Ras Lanuf	220
Do.	do.	Az Zawiya Oil Refining Co. (National Oil Co. of Libya)	Az Zawiya	120
Do.	do.	Arabian Gulf Oil Co. (National Oil Co. of Libya)	Tobruk	20
Do.	do.	do.	Sarir	10
Do.	do.	National Oil Co. of Libya	Marsa el Brega	8

[1]Construction completed. Production to begin in 2005.

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The Mineral Industry of Madagascar

By Thomas R. Yager

The Republic of Madagascar, which is the world's fourth largest island, is located about 420 kilometers (km) east of Mozambique in the Indian Ocean. Madagascar had an area of 587,040 square kilometers (km^2) and a population of more than 16 million in 2003. Its mining industry was chiefly noted for the production and export of chemical- and metallurgical-grade chromite ore, high-quality crystalline flake graphite, and precious, semiprecious, and ornamental gemstones. In addition to these minerals, small quantities of beryllium and gold and such industrial mineral commodities as cement, feldspar, ornamental stone, quartz, and salt were produced. Madagascar was also known to have resources of bauxite, coal, cobalt, copper, lead, manganese, nickel, platinum, tin, titanium, zinc, and zirconium.

In 2004, Madagascar's nominal gross domestic product (GDP) based on purchasing power parity amounted to about $14.9 billion. Madagascar's real GDP increased by 5.3% in 2004 after rising by 9.8% in 2003. The manufacturing sector accounted for an estimated 13% of the nominal GDP; energy, 1%; and mining and construction materials, less than 1% (Ministère de l'Economie, des Finances et du Budget, 2004, p. 133; International Monetary Fund, 2005b, p. 208; 2005§[1]).

In 2004, real output in the mining sector was estimated to have grown at a rate of 7% after increasing by 10% in 2003 and decreasing by 34% in 2002. The construction materials sector grew by nearly 8% in 2004, and the energy sector, by 5% (Ministère de l'Economie, des Finances et du Budget, 2004, p. 130).

Commodity Review

Metals

Chromium.—The state-owned company Kraomita Malagasy (KRAOMA) produced chromite concentrates and lumpy ore from its mine at Ankazotaolana; the company exported to China, Japan, and Sweden. In 2004, chromite production increased to 77,386 metric tons (t) from 45,040 t in 2003 and 10,700 t in 2002 because of increased demand from China and increased political stability. KRAOMA planned to increase production to about 150,000 t in 2005, and exports, from 100,000 t to 130,000 t (Rampanjato, 2005a).

The company planned to restart production at the Bemanevoka Mine in 2006 because of the impending resource depletion at Ankazotaolana. The reopening of the Bemanevoka Mine, which shut down in 1968, has been delayed by technical difficulties in recent years. Reserves at Bemanevoka and Ankazotaolana were estimated to be 3 million metric tons (Mt) and 750,000 t, respectively. In 2004, exports of chromite were reported to be 84,918 t (Andrianatenaina, 2005b; L'Express de Madagascar, 2005; Rampanjato, 2005a).

Cobalt and Nickel.—Dynatec Corp. of Canada (53%) and Phelps Dodge Corp. of the United States (47%) were engaged in a joint venture to develop the Ambatovy nickel and cobalt deposit, which was expected to produce 60,000 metric tons per year (t/yr) of refined nickel and 5,000 t/yr of cobalt for more than 20 years. In addition to a mine, the project included the development of infrastructure, a power supply, and a metallurgical plant near Toamasina. The companies planned to complete their feasibility study at Ambatovy in the first quarter of 2005. If the feasibility study were to yield favorable results, then production could start in 2007. Resources at Ambatovy were estimated to be 210 Mt at grades of 1.1% nickel and 0.1% cobalt (Dynatec Corp., 2004a, b; Mining Journal, 2004).

In early 2004, Diamond Fields International Ltd. (DFI) of Canada engaged in exploration at the Valozoro nickel laterite deposit. Valozoro, which is located in south-central Madagascar, had resources of 3.7 Mt at a grade of 1.75% nickel. The company also engaged in exploration at its recently acquired Jango property, which is located northwest of Antananarivo (Diamond Fields International Ltd., 2004, 2005).

Copper and Platinum-Group Metals.—In 2004, Jubilee Platinum plc of the United Kingdom and its joint-venture partners explored for copper at Pachoud-Lanjanina, which had resources of 900,000 t at a grade of 1.9% copper. Jubilee planned further exploration work at Pachoud-Lanjanina to expand the resource. The company also explored at the Tsaratanana copper-nickel-platinum-group-metals property in the Londokomanana District. Jubilee held other exclusive license concessions that included the Ambodilafa copper-nickel property. It planned to convert its properties to 10-year exploration permits (Jubilee Platinum plc, 2004).

Gold.—Artisanal miners produced gold at numerous deposits in Madagascar, which include those at Ampanihy and Maevatanana in the east and Andavakoera in the northeast. Officially reported gold exports were only 5 kilograms (kg) in 2004. In July, Golden Deeps Ltd. of Australia acquired the Kelimaizina gold prospect in north-central Madagascar from Kalgoorlie Mine Management Pty. Ltd. Kalgoorlie engaged in exploration at Kelimaizina in November 2003. In November 2004, Pan African Mining Corp. of Canada began drilling at its Mountain of Gold property in the Dabolava region of the Central-West Plateau (Golden Deeps Ltd., 2004; Pan African Mining Corp., 2004; Rampanjato, 2005c).

Iron Ore.—Cline Mining Corp. of Canada acquired the Bekisopa iron ore property in 2004. The company had exclusive rights to conduct exploration, to complete a feasibility study, and to proceed to mining status. Resources at Bekisopa were estimated to be nearly 99 Mt at an average grade of 45% iron. Cline planned additional exploration work at Bekisopa to upgrade the resource (Cline Mining Corp., 2004).

Titanium and Zirconium.—QIT Madagascar Minerals S.A. (QMM) [QIT Fer et Titane of Canada (a subsidiary of Rio Tinto plc), 80%, and the Government of Madagascar, 20%] planned

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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to make an investment decision on its mineral sands project at Tolagnaro in southeastern Madagascar in 2005. If QMM were to proceed with the project, then production would be 700,000 t/yr of ilmenite and 33,000 t/yr of zircon at full capacity. The cost of the project, which included power, roads, and a new port near Tolagnaro, was estimated to be $350 million. Resources at Tolagnaro were 67 Mt of ilmenite and 3 Mt of zircon (Mining Journal, 2004; Ministère de l'Energie et des Mines, 2004).

Kumba Resources and Ticor Ltd. of Australia signed a joint-venture agreement to conduct a feasibility study on the Toliara mineral sands deposit. The companies planned to complete the study by the end of 2006. Kumba and Ticor had the option to purchase the interest of Madagascar Resources NL in Toliara after the completion of the study (African Mining, 2004).

Industrial Minerals

Cement.—Holcim (Madagascar) S.A. and SA Nouvelle Cimenterie Amboanio (66% owned by the Lafarge Group of France) operated two cement plants with capacities of 150,000 t/yr and 40,000 t/yr, respectively (table 2). In 2004, Madagascar's consumption of cement increased to nearly 500,000 t from 424,000 t in 2003. Higher consumption was attributable to such public works projects as schools and roads (Andrianatenaina, 2005a).

Diamond.—In October 2004, Majescor Resources Inc. of Canada formed a joint venture with the DeBeers Group to explore for diamond at the former company's properties in northern and central Madagascar. The companies planned joint exploration in late 2004 and 2005. DeBeers spent more than $700,000 on diamond exploration in Madagascar in 2003 and 2004. DFI reduced its holdings on the Horombe Plateau to the area where kimberlitic ilmenites were found (Majescor Resources Inc., 2004; Diamond Fields International Ltd., 2005). Pan African Mining Corp. started diamond exploration in Madagascar in September.

Gemstones.—Madagascar was one of the world's leading producers of sapphire; most domestically mined sapphire was produced by artisanal miners at Ilakaka and Sakara in the south-central part of the country. Reported exports of sapphire fell to 5,890 kg in 2004 from 9,326 kg in 2002; the decrease was attributable to lower grades of sapphire at depths of 10 meters (m) at Ilakaka. Sapphire was discovered at depths of about 26 m, but mining at that depth would require the use of machinery unavailable to artisanal miners (Henricus, 2005; Rampanjato, 2005b).

MineCore International Inc. of the United States (known as Americana Gold and Diamond Holdings Inc. until July 2004) held the North Fork 14 sapphire concession at Ilakaka. The company planned to start mining sapphire and semiprecious gemstones in 2005; production could be nearly 3,000 kilograms per year (kg/yr) of sapphire and 1,400 kg/yr of semiprecious stones (Platinum Works Inc., 2001, p. 46; Americana Gold and Diamond Holdings Inc., 2003; MineCore International Inc., 2005).

Ruby was mined near Andilamena in north-central Madagascar and Vatomandry on the east coast. Reported exports of ruby fell to 741 kg in 2004 from 889 kg in 2002. The decrease in production was attributable to continued uncertainty about ownership of claims. Ruby mining reportedly led to environmental damage to the forest near Andilamena (Henricus, 2005; Rakotomalala, 2005; Rampanjato, 2005b).

Emerald was mined at Mananjary near the east coast. Reported exports of emerald rose to 53 kg in 2004 from 31 kg in 2002. The increase in production may be attributable to a new find of high-quality emerald (Henricus, 2005; Rampanjato, 2005b).

A new tourmaline-bearing pegmatite was discovered in the Antsirabe area. Production was sporadic because the deposit was in hard rock, and mining was conducted with hand tools. The supply of morganite, which is a type of beryl that obtains its pink color from inclusions of manganese, fell because of a cave-in at the most productive mine. Small amounts of aquamarine were produced (Henricus, 2005). In recent years, almandine, grossularite, pyrope-spessartine, rhodolite, and spessartine garnet have been mined in Madagascar.

Madagascar produced a wide range of ornamental stones that included agate, aragonite, jasper, labradorite, and rose quartz. Marbres et Granits de Madagascar (MAGRAMA) was the country's leading producer of labradorite. In 2003, MAGRAMA increased its production of labradorite to 3,500 t from 2,200 t in 2002; the company expected to increase production by 20% in 2004.

In 2004, the reported export value of ornamental, precious, and semiprecious stones amounted to $17 million, or about 3% of total exports. Ornamental stones accounted for $11.4 million; semiprecious gemstones, $2.9 million; and precious gemstones, $2.7 million (Ministère de l'Economie, des Finances et du Budget, 2004, p. 139; Rampanjato, 2005c).

The low value of Madagascar's reported gemstone exports was attributable to the lack of a significant domestic lapidary industry and high rates of smuggling. Reported exports of cut gemstones amounted to only 2 kg in 2004; most semiprecious and ornamental stones were exported in rough form. In early 2004, cutting and polishing facilities employed about 1,000 workers, about 80% of whom were involved in cutting such ornamental stones as agate and labradorite. Most of the cutting and polishing facilities were located in Antananarivo or near individual mines (Moscato, 2004; Rampanjato, 2005c).

Illegal exports of sapphire to Thailand were estimated to be about 2,600 kg/yr, and those to other countries, about 500 kg/yr. The value of undeclared gemstone exports was estimated to be $100 million. The World Bank Group planned to increase Madagascar's reported gemstone exports to between $40 million and $80 million per year mostly by expanding the domestic lapidary industry (Moscato, 2004; Gazette de la Grande Ile, 2005; Mercia, 2005).

Graphite.—The leading producer of graphite was Etablissements Gallois, which had mines at Ambalafotaka, Antsirakambo, and Marovintsy on the east coast. The company produced about 10,000 t/yr of graphite. Etablissement Izouard, Etablissement Rostaing, Société Louys, and Société Minière de la Grande Ile also mined graphite. In 2004, exports of graphite were estimated to be 14,000 t at a value of $5.2 million, or 1% of total exports (Ministère de l'Economie, des Finances et du Budget, 2004, p. 139).

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Mineral Fuels

Petroleum.—Galana Petroleum Ltd. of Mauritius managed Madagascar's only petroleum products refinery at Toamasina. The company produced about 1.4 million barrels per year of residual fuel oil, of which 15% was consumed locally and 85% was exported. In November, the Government announced that it was opening a civil case against Galana for allegedly polluting the air and water near the refinery. The company denied the charges. In 2004, national imports of petroleum products amounted to $158.5 million, or 15% of total imports (Ministère de l'Economie, des Finances et du Budget, 2004, p. 140; Reuters, 2004).

In August 2004, Exxon Mobil Corp. purchased 40% of the Majunga Offshore concession, which was located to the northwest of Madagascar. Vanco Energy Company and Norsk Hyrdo ASA each held a 30% interest in the Manjunga Offshore concession. In late December, ExxonMobil signed a contract for an exploration license that covered 36,500 km^2 off Cape St. Andre. Sterling Energy held the Ambilobe and the Ampasindva licenses, which were located to the north of the Majunga Offshore. Madagascar Oil (a subsidiary of Vuna Capital of the United Kingdom) held an exploration license for the bituminous sands at Tsimiroro and bituminous clay at Bemolanga (Africa Energy Intelligence, 2005).

Infrastructure

Jiro Sy Rano Malagasy (JIRAMA) was the Government-owned utility that produced most of Madagascar's electricity. By November, Compagnie Generale d'Electricite of France and Lahmeyer International of Germany had submitted bids to take over management of JIRAMA.

In 2004, Madagascar produced 983.6 gigawatthours (GWh) of electricity compared with 893.6 GWh in 2003 and 721.3 GWh in 1999. Hydroelectric power sources provided 65% of the country's electricity, and fossil fuel sources accounted for the remaining 35%. National consumption of electricity was 755.6 GWh compared with 675.5 GWh in 2003 and 571.5 GWh in 1999 (International Monetary Fund, 2005a, p. 94).

Madagascar had a road network of 33,000 km and a rail network of 800 km. The road and rail networks have deteriorated during the past 10 years; the Government planned to rehabilitate 14,000 km of roads. The country also had 6 international and 12 local ports; the most important international port was Toamasina (Ministère de l'Energie et des Mines, 2004).

Outlook

The International Monetary Fund (2005b, p. 208) predicted that Madagascar's GDP would rise by 6.4% in 2005 and 7% in 2006. High rates of GDP growth may lead to increased domestic demand for such local construction materials as cement, gravel, limestone, and sand. Madagascar's beryl, chromite, gemstone, gold, graphite, and mica industries depended heavily upon world market conditions and political stability; the same held true for such undeveloped mineral commodities as nickel, titanium, and zirconium. The World Bank Group (2003, p. 41) estimated that development of the Ambatovy nickel project would result in exports of $185 million per year, and the Tolagnaro mineral sands project, $80 million per year.

References Cited

Africa Energy Intelligence, 2005, Oil sun rises on Indian Ocean, too: Africa Energy Intelligence, no. 386, February 2-15 p. 1.

African Mining, 2004, Kumba stakes a claim to a world-beating resources: African Mining, v. 9, no. 1, January-February, p. 4-5.

Americana Gold and Diamond Holdings Inc., 2003, AGDM in depth: Reno, Nevada, Americana Gold and Diamond Holdings Inc., January, 5 p.

Andrianatenaina, Doda, 2005a, Hausse des prix—Le ciment deviance les carburants: L'Express de Madagascar [Antananarivo, Madagascar], April 2, 2 p.

Andrianatenaina, Doda, 2005b, Ressources minières—Kraoma exploite le site de Bemanevoka: L'Express de Madagascar [Antananarivo, Madagascar], February 28, 1 p.

Cline Mining Corp., 2004, Cline Mining Corporation acquires the Madagascar Bekisopa iron ore deposit: Sudbury, Ontario, Canada, Cline Mining Corp. press release, June 14, 2 p.

Diamond Fields International Ltd., 2004, Valozoro nickel update: Vancouver, British Columbia, Canada, Diamond Fields International Ltd. press release, March 4, 2 p.

Diamond Fields International Ltd., 2005, Diamond Fields year end review of projects: Vancouver, British Columbia, Canada, Diamond Fields International Ltd. press release, January 18, 3 p.

Dynatec Corp., 2004a, Ambatovy joint venture partners reviewing feasibility study: Richmond Hill, Ontario, Canada, Dynatec Corp. press release, December 10, 1 p.

Dynatec Corp., 2004b, Progress report on Ambatovy Nickel Project: Richmond Hill, Ontario, Canada, Dynatec Corp. press release, April 5, 1 p.

Gazette de la Grande Ile, 2005, Pierres précieuses—50 kg par semaine partent frauduleusement vers la Thaïlande: Gazette de la Grande Ile [Antananarivo, Madagascar], August 9, 1 p.

Golden Deeps Ltd., 2004, Acquisition—Kelimaizina gold prospect—Madagascar: West Perth, Australia, Golden Deeps Ltd. press release, July 27, 2 p.

Henricus, Jennifer, 2005, As supply decreases, prices set to grow: Jewellery News Asia, no. 248, April, p. 118-128.

International Monetary Fund, 2005a, Republic of Madagascar—Selected issues and statistical appendix: Washington, DC, International Monetary Fund, September 27, 22 p.

International Monetary Fund, 2005b, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Jubilee Platinum plc, 2004, Extension of Madagascar agreement and concessions—Reconnaissance samples reveal high copper values: London, United Kingdom, Jubilee Platinum plc press release, July 1, 2 p.

L'Express de Madagascar, 2005, Ressources minières—Kraoma exploite le site de Bemanevoka: L'Express de Madagascar [Antananarivo, Madagascar], February 28, 1 p.

Majescor Resources Inc., 2004, Majescor forms joint venture with DeBeers in Madagascar: Montreal, Quebec, Canada, Majescor Resources Inc. press release, October 15, 2 p.

Mercia, Rolly, 2005, Trafic de saphir—50 kg par semaine expédiés en Thaïlande: Gazette de la Grande Ile [Antananarivo, Madagascar], May 17, 1 p.

MineCore International Inc., 2005, MineCore signs LOI to acquire American Gem Corp.: Fort Lauderdale, FL, MineCore International Inc. press release, March 15, 3 p.

Mining Journal, 2004, Mining Journal special publication—Madagascar: Mining Journal, January, 12 p.

Ministère de l'Economie, des Finances et du Budget, 2004, Rapport economique et financier 2003-2004: Antananarivo, Madagascar, Ministère de l'Economie, des Finances et du Budget, 145 p.

Ministère de l'Energie et des Mines, 2004, Mining in Madagascar—A treasure island come of age: Antananarivo, Madagascar, Ministry of Energy and Mines, 6 p.

Moscato, Derek, 2004, Madagascar's blue chips: Colored Stone, v. 17, no. 1, January/February, p. 42-44.

Platinum Works Inc., 2001, North Fork 14 sapphire mining project—Madagascar—Project report: Pompano Beach, Florida, Platinum Works Inc., 196 p.

Digitized by Google

Pan African Mining Corp., 2004, Pan African commences diamond drilling on the Mountain of Gold project: Vancouver, British Columbia, Canada, Pan African Mining Corp. press release, November 24, 2 p.
Rakotomalala, Mahefa, 2005, Andilamena,: L'Express de Madagascar [Antananarivo, Madagascar], January 28, 1 p.
Rampanjato, Arilala, 2005a, Exportation de chrome—130,000 tonnes prévues cette année: Gazette de la Grande Ile [Antananarivo, Madagascar], August 2, 1 p.
Rampanjato, Arilala, 2005b, Pierres précieuses—L'aces au marche international reste difficile: Gazette de la Grande Ile [Antananarivo, Madagascar], August 22, 1 p.
Rampanjato, Arilala, 2005c, Ressources minières—Plus de 9 tonnes de pierres précieuses exportées en 2004: Gazette de la Grande Ile [Antananarivo, Madagascar], June 8, 1 p.
Reuters, 2004, Oil company sued in Madagascar over pollution: Reuters press release, November 16, 2 p.
World Bank Group, 2003, Madagascar—Mineral resources governance project—Project appraisal document: Washington DC, World Bank, 72 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Madagascar, World Economic Outlook Database, accessed July 15, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

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TABLE 1
MADAGASCAR: PRODUCTION OF MINERAL COMMODITIES[1]

(Kilograms unless otherwise specified)

Commodity[2]		2000	2001	2002	2003[e]	2004[e]
METALS						
Beryllium, beryl in quartz concentrates, industrial and ornamental[e]		1,696 [3]	1,000	1,000	1,000	1,000
Chromium, marketable output:						
Chromite concentrate, gross weight	metric tons	24,922	6,599	2,700 [r, e]	12,000	21,000
Chromite ore, lumpy	do.	106,371	17,038	8,000 [e]	33,000	56,000
Total	do.	131,293	23,637	10,700 [r]	45,040 [3]	77,386 [3]
Gold, mine output, Au content[4]		5	(5)	-- [r, e]	10 [3]	5 [6]
INDUSTRIAL MINERALS						
Abrasives, natural (industrial only)[e]		1,300	1,300	1,300	1,300	1,300
Cement, hydraulic	metric tons	50,938	51,882	33,000 [r, e]	70,000 [r]	110,000
Clay, kaolin[e]	do.	170	170	170	170	170
Feldspar[e]	do.	7 [r, 3]	3 [r]	3 [r]	3 [r]	3
Gemstones:[6, 7]						
Amethyst[8]		1,070 [r]	383 [r]	617 [r]	620 [r]	620
Cordierite		625	4,241	158	160	160
Emerald		11 [r]	(5) [r]	31 [r]	40 [r]	53 [6]
Garnet		324	2,092	599	600	600
Ruby		8 [r]	941	889 [r]	800 [r]	741 [6]
Sapphire		9,536	8,470	9,326 [r]	6,000	5,890 [6]
Tourmaline[8]		40,353 [r]	78,971 [r]	63,722 [r]	64,000 [r]	64,000
Graphite, all grades:	metric tons	40,328	2,013	2,000 [r, e]	15,000 [r]	15,000
Mica, phlogopite	do.	66	90	90 [e]	90	90
Ornamental stones:[7]						
Agate[e]		49,675 [3]	25,000	20,000 [r]	25,000 [r]	25,000
Labradorite	metric tons	629	797	4,183	6,600	8,000
Quartz[6, 9]	do.	1,978	574	423	430	430
Salt, marine	do.	25,530	25,928	17,000	26,000	26,000
Stone:						
Dimension[e]	do.	200	200	200	200	200
Marble	do.	1,222	5,600	5,600 [e]	5,000	5,000
MINERAL FUELS AND RELATED MATERIALS						
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	571 [r]	488 [r]	237 [r]	500 [r]	500
Kerosene and jet fuel	do.	418 [r]	332 [r]	163 [r]	350 [r]	350
Distillate fuel oil	do.	683 [r]	600 [r]	357 [r]	750 [r]	750
Residual fuel oil	do.	1,208 [r]	578 [r]	317 [r]	670 [r]	670
Liquefied petroleum gas	do.	46 [r]	41 [r]	14 [r]	30 [r]	30
Total	do.	2,926 [r]	2,039 [r]	1,088 [r]	2,300 [r]	2,300

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. -- Zero.

[1]Includes data available through September 30, 2005.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (other clays, sand and gravel, and stone) and industrial calcite presumably were produced, but output was not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Does not include smuggled artisanal production, which was estimated to be from 1,000 to 2,000 kilograms per year.

[5]Less than 1/2 unit.

[6]Reported exports.

[7]Does not include smuggled artisanal production.

[8]Includes both gem- and ornamental-quality.

[9]Quartz production included 6 metric tons of rose quartz in 2000 and 11 metric tons in 2001.

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TABLE 2
MADAGASCAR: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Holcim (Madagascar) S.A. (Holcim Group, 90%)	Plant at Ibity	150,000 cement; 120,000 clinker.
Do.		SA Nouvelle Cimenterie Amboanio (LaFarge Group, 66%, and Moustansir Ibaramdty Family, 34%)	Plant at Mahajanga	40,000 cement; 40,000 clinker.
Chromium		Kraomita Malagasy (Government, 100%)	Mine at Ankazotaolana	250,000 run of mine.
Do.		do.	Mine at Bemanekiva	40,000 run of mine.
Gemstones:				
Emerald	kilograms	Artisanal and small-scale miners	Mines at Mananjary	55.[e]
Labradorite		Marbres et Granits de Madagascar	Mines at Ambatofinandrahana and Bekily	4,200.[e]
Ruby	do.	do.	Mines at Andilamena and Vatomandry	1,000.[e]
Sapphire	do.	do.	Mines at Ilakaka and Sakara	10,000.[e]
Graphite		Etablissements Gallois	Artsirakambo Mine near Brickaville	4,800.
Do.		do.	Marovinsty Mine near Vatomandry	3,600.
Do.		do.	Ambalafotaka Mine	NA.
Do.		Société Minière de la Grande Ile	Ambatomitamba Mine near Tamatave	6,000.
Do.		Etablissements Izouard	Faliarno Mine near Moramanga	2,000.
Do.		Etablissements Rostaing and Société Louys	NA	NA.
Mica		Societe des Mines d'Ampandranhava	Tolagnaro	2,000 processed.
Petroleum, refined	thousand 42-gallon barrels	Galana International, Groupe Trimeta, Gulf Oil Corporation, and Petroleum India International	Refinery at Toamasina	5,475.

[e]Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

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THE MINERAL INDUSTRY OF MALAWI

By Thomas R. Yager

Malawi, which is a small country in southern Africa, was a producer of cement, coal, crushed stone, dolomite, kaolin, lime, and limestone for domestic consumption (table 1). The country also produced and exported dimension stone and gemstones. Malawi had deposits of bauxite, columbium (niobium) and tantalum, granite, graphite, kyanite, monazite, phosphate rock, pyrite, silica sand, titanium, uranium, vermiculite, and zirconium (table 3).

In 2004, Malawi's gross domestic product (GDP) amounted to about $7 billion at purchasing power parity. The GDP rose by 4.3% in 2004 compared with 3.9% in 2003. Manufacturing accounted for 11% of the GDP; construction, 2%; electricity and water, 1%; and mining and quarrying, 1%. In 2003, the mining sector grew by 23.5%, and the construction sector, by 4%. Formal employment in the mining sector amounted to about 2,700 workers in 2004; artisanal mining for aggregate and sand and gravel was estimated to be considerably greater (International Monetary Fund, 2004, p. 46; 2005, p. 206; 2005§[1]; Ackim Wona, Chief Mining Engineer, Malawi Department of Mines, written commun., July 18, 2005).

Commodity Review

Metals

Nickel and Platinum-Group Metals.—Albidon Ltd. of Australia held exclusive prospecting licenses for the Katakwi and the Mpemba projects. Following exploration at Mpemba in 2004, WMC Resources Exploration Pty. Ltd. of Australia decided to terminate its joint venture with Albidon. Further exploration for nickel and platinum-group metals at Katakwi and Mpemba was planned by Albidon in early 2005 (Albidon Ltd., 2005, p. 17-18).

Titanium and Zirconium.—Millennium Mining Ltd. (a subsidiary of Malawi Minerals Ltd.) held exclusive prospecting licenses for the Lake Chilwa, the Makanjila, and the Senga Bay mineral sands deposits. The company was engaged in feasibility studies on producing 500,000 metric tons per year (t/yr) of ilmenite from Makanjila and Senga Bay (Mining Review Africa, 2005).

Depending on favorable results of these studies, Millennium planned to conduct a feasibility study on building a smelter at Chipoka. The smelter would use raw material from Makanjila and Senga Bay to produce 250,000 t/yr of titanium slag, about 125,000 t/yr of pig iron, and significant amounts of rutile and zircon. The smelter was expected to cost $250 million; the mining projects, $50 million; and the feasibility studies, $4 million. Power requirements for the smelter were expected to be 100 megawatts (MW) (Mining Review Africa, 2005).

Allied Procurement Agency and Mineral Sands Ltd. of South Africa held an exclusive prospecting license for mineral sands at Chipoka. The companies planned to start mining at Chipoka in 2005 (Ackim Wona, Chief Mining Engineer, Malawi Department of Mines, written commun., July 18, 2005).

Industrial Minerals

Gemstones.—Malawi produced a variety of gemstones that included ruby and sapphire from the Chimwadzulu Hill Mine. Starting in early 2003, systematic prospecting and an expansion in mining substantially increased the quantity and quality of production at Chimwadzulu Hill. The mine produced as much as 1 kilogram per month (kg/mo) of cuttable ruby. By the end of 2004, the capacity of the mine increased to 5 kg/mo of cuttable ruby and pinkish-orange sapphire with the installation of a new washing plant (Boehm, 2004; Laurs, 2004).

Lime.—National lime production increased to 23,095 t in 2004 from 18,877 t in 2003 (table 1). Production increased because of higher demand from the construction, livestock and poultry, and paint manufacturing industries (Ackim Wona, Chief Mining Engineer, Malawi Department of Mines, written commun., July 18, 2005).

Stone, Crushed.—The production of aggregate rose to 168,600 metric tons (t) in 2004 from 159,954 t in 2003 because of increasing infrastructure development. Large-scale quarries accounted for 89% of domestic production, and artisanal miners, 11%. Shayona Cement Corp. quarried limestone for use in its cement plant at Livwezi. In 2004, the company's limestone production fell to 21,224 t from 23,965 t because of coal shortages at the cement plant (Ackim Wona, Chief Mining Engineer, Malawi Department of Mines, written commun., July 18, 2005).

Mineral Fuels

Coal.— Mchenga Coal Mines operated a mine in the Livingstonia coal field. Domestic demand for coal was about 100,000 t/yr; consumers included beverage manufacturers, breweries, and the cement, soap, and textile industries. Mchenga also exported about 12,000 t/yr of coal to Mbeya Cement of Tanzania. In the fourth quarter of 2004, the company planned to start exploration for additional reserves in the Livingstonia coal field. Mchenga produced at a rate of 60,000 t/yr in late 2004; the company planned to open the Chombe Mine in Livingstonia and to increase its output to 96,000 t/yr by March 2005 (Chimwala, 2004a, b).

Uranium.—Paladin Resources Ltd. of Australia planned to start a bankable feasibility study on the Kayelekera uranium project by mid-2005. The 18-month study was expected to cost about $2 million. Capital costs were estimated to range from $50 million to $55 million. Paladin planned to produce

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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1,000 t/yr of U_3O_8 starting in 2008 or 2009 if the feasibility study yielded favorable results. The life of the mine was expected to be 10 years (Paladin Resources Ltd., 2004).

Infrastructure

The Electricity Supply Company of Malawi (ESCOM) was the country's only large-scale producer of electricity. ESCOM operated power stations with a combined capacity of 290 MW, of which 285 MW was from eight hydroelectric plants. About 21% of ESCOM's hydroelectric capacity was unavailable because of aging and damaged equipment, aquatic weeds, and siltation. Deforestation for charcoal and subsistence farming was the main cause of siltation; Malawi lost an average of 1,250 square kilometers per year of forest (Munthali, 2004; United Nations Integrated Regional Information Networks, 2004a).

In May 2004, the Organization of the Petroleum Exporting Countries Fund for International Development agreed to lend Malawi $5 million to upgrade about 260 kilometers (km) of roads. The upgrade was likely to be completed in 2007 or 2008. Malawi had about 15,500 km of roads, of which 3,600 km was paved (United Nations Integrated Regional Information Networks, 2004b).

Outlook

Because most output of Malawi's mineral industry was for local consumption in 2004, the short-term outlook for most currently produced minerals depends on the state of the domestic economy. The International Monetary Fund (2005, p. 208) predicted that Malawi's economy would grow by 4.8% in 2005 and 5.1% in 2006. The outlook for many undeveloped mineral commodities is tied to strong global demand because severe poverty limits domestic markets for bauxite, columbium (niobium) and tantalum, rare-earth elements, titanium, and uranium.

References Cited

Albidon Ltd., 2005, Annual report 2005: Nedlands, Australia, Albidon Ltd., 55 p.

Boehm, Edward, 2004, New ruby production from Malawi: Gems & Gemology, v. 40, no. 1, spring, p. 71.

Chimwala, Marcel, 2004a, Coal miner to begin Malawi exploration: Creamer Media Pty. Ltd. press release, October 15, 1 p.

Chimwala, Marcel, 2004b, SA equipment firm in Malawi coal-mine deal: Creamer Media Pty. Ltd. press release, November 12, 1 p.

International Monetary Fund, 2004, Malawi—Selected issues and statistical appendix: Washington, DC, International Monetary Fund, December 6, 80 p.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Laurs, B.M., 2004, Update on several gem localities in Zambia and Malawi: Gems & Gemology, v. 40, no. 4, spring, p. 347-350.

Mining Review Africa, 2005, Titanium projects could help develop the Nacala Corridor: Mining Review Africa, no. 1, p. 20.

Munthali, Ephraim, 2004, Government wants power from the lake: Malawi Nation, December 16, 1 p.

Paladin Resources Ltd., 2004, Kayelekera uranium project—Malawi, Southern Africa (uranium price surge justifies feasibility review): Subiaco, Australia, Paladin Resources Ltd., 4 p.

United Nations Integrated Regional Information Networks, 2004a, Malawi—Erratic power supplies affect GDP: New York, New York, United Nations Integrated Regional Information Networks press release, May 5, 1 p.

United Nations Integrated Regional Information Networks, 2004b, Malawi—OPEC gives $5m for road upgrades: New York, New York, United Nations Integrated Regional Information Networks press release, May 13, 1 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Malawi, World Economic Outlook Database, accessed July 18, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

TABLE 1
MALAWI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
Cement, hydraulic		155,920	180,761	174,283	190,000 e	190,000 e
Coal:						
Bituminous		34,250	34,410	43,372 r	47,037 r	40,891
Lignite		--	--	-- r	-- r	--
Dolomite		--	49	4,394	5,400 e	5,400 e
Gemstones	kilograms	1,200 r, e	1,800 r, e	2,305 r	2,297 r	1,820
Kaolin		719	825	636	800 e	800 e
Lime		21,886	6,177 r	6,776 r	18,877 r	23,095
Ornamental stones		NA	NA	120	450	320
Sodium silicate		1,538	--	--	-- e	-- e
Stone:						
Crushed for aggregate		125,200 r	594,979	113,992 r	159,954 r	168,600
Dimension, crude and partly worked		78	483	170 r, e	130 r, e	130 e
Limestone, for cement		144,000 e	167,000 e	86,234 r	23,965 r	21,224
Vermiculite		--	1	-- r	-- r	--

eEstimated; estimated data are rounded to no more than three significant digits. rRevised. NA Not available. -- Zero.

[1]Includes data available through July 19, 2005.

[2]In addition to commodities listed, modest quantities of gypsum and salt and unlisted varieties of crude construction materials (clays, gravel, and other stone) may also be produced, but information is inadequate to make reliable estimates of output levels.

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TABLE 2
MALAWI: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Portland Cement Co. Ltd.	Plant at Blantyre	288,000.
Do.	do.	Plant at Changalume	180,000.
Do.	Shayona Cement Corp.	Plant at Livwezi	37,000.
Coal, bituminous	Mchenga Coal Mines	Mine at Mchenga	60,000.
Dimension stone	Ilomba Granite of Blantyre	Mine at Ilomba Hill	NA.
Fertilizers	Optichem Ltd.	Plant at Blantyre	40,000.
Limestone	Shayona Cement Corp.	Mine in Kasungu Province	NA.
Ruby and sapphire kilograms	Agricola Resources plc	Mine at Chimwadzulu Hill	10 ruby; 30 sapphire.[e]

[e]Estimated. NA Not available.

TABLE 3
MALAWI: MINERAL RESOURCES IN 2004[1]

Commodity	Deposit	Tonnage	Grade	Mineral content
Bauxite	Mulanje Mountain	26 Mt	43.3% Al_2O_3	11 Mt Al_2O_3.
Coal	Ngaga	15 Mt	NA	NA.
Do.	Mwabvi	4.7 Mt	NA	NA.
Do.	Livingstonia (Mchenga Mine)	2 Mt	NA	NA.
Columbium (niobium)	Tundulu	0.9 Mt	0.37% Nb_2O_5	3,300 t Nb_2O_5.
Do.	Chilwa Island	0.38 Mt	0.95% Nb_2O_5	3,600 t Nb_2O_5.
Do.	Ilomba Hill	0.1 Mt	3% Nb_2O_5	3,000 t Nb_2O_5.
Kaolin	Linthipe	14 Mt	33.8% Al_2O_3	NA.
Limestone	Malowa Hill	4.1 Mt	52% CaO	NA.
Marble	do.	3.7 Mt	36.21% CaO	NA.
Phosphate rock	Tundulu	2 Mt	17% P_2O_5	340,000 t.
Pyrite	Chisepo	34 Mt	8% S	2.7 Mt.
Strontium and rare earths	Kangankunde	11 Mt	8% Sr; 2% REE	880,000 t Sr; 220,000 t REE.
Titanium	Makanjila	1,000 Mt	5.2% ilmenite	52 Mt ilmenite
Do.	Lake Chilwa	1,000 Mt	7.05% ilmenite; 0.11% rutile; 1.16% zircon	71 Mt ilmenite; 1.1 Mt rutile; 12 Mt zircon.
Do.	Salima	500 Mt	8.4% ilmenite; 0.38% rutile; 0.28% zircon	42 Mt ilmenite; 1.9 Mt rutile; 1.4 Mt zircon.
Do.	Tengani	108 Mt	11% ilmenite; 2% rutile; 1% zircon	12 Mt ilmenite; 2.2 Mt rutile; 1.1 Mt zircon.
Uranium	Kayelakera	7.7 Mt	0.15% U_3O_8	11,500 t U_3O_8.
Vermiculite	Mwanza District	2.5 Mt	10% vermiculite	250,000 t.

NA Not available.

[1]Abbreviations used for commodities in this table include the following: Al_2O_3--aluminum oxide; CaO--calcium oxide; Nb_2O_5--columbium (niobium) oxide; P_2O_5--phosphorous pentoxide; REE--rare-earth elements; S--sulfur; Sr--strontium; and U_3O_8--uranium oxide. Abbreviations used for units of measure include the following: Mt--million metric tons, and t--metric tons.

Sources:

Council for Mineral Technology, 2002, Mineral scan of the Nacala Spatial Development Initiative—Key findings: Randburg, South Africa, Council for Mineral Technology, 40 p.
Malawi Ministry of Energy and Mining, 1997, Mineral potential of Malawi—Opportunities for investment: Lilongwe, Malawi, Malawi Ministry of Energy and Mining, 14 p.
Malunga, G.W.P., 2002, Malawi, *in* Mining Annual Review 2002: Mining Journal Ltd., CD-ROM.
Moles, Mike, 2002, Unlocking Malawi's mineral resources: African Mining, v. 7, no. 1, January-February, p. 18-21.
Tassell, Arthur, 2002, Malawi's mineral sector—Still small but growing fast: African Mining, v. 7, no. 5, September-October, p. 42-48.

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The Mineral Industries of Mali, Mauritania, and Niger

By Omayra Bermúdez-Lugo

MALI

Mali is a landlocked country in West Africa that is bordered by Algeria, Burkina Faso, Côte d'Ivoire, Guinea, Mauritania, Niger, and Senegal. In 2004, the population was estimated to be about 12 million with an estimated growth rate of about 2.78%. The country's total land and water area is 1.24 million square kilometers (km^2), which is comparable to slightly less than twice the size of the State of Texas (U.S. Central Intelligence Agency, 2004§[1]). According to International Monetary Fund (IMF) (2005, p. 15-16) reports, Mali's gross domestic product (GDP) growth rate declined to 2.2% in 2004 from 7.4% in 2003. The decline was attributed to lower grain and gold outputs. The IMF (2005§) estimated Mali's GDP based on purchasing power parity to be about $12.5 billion and the per capita GDP based on purchasing power parity to be $1,024 in 2004.

Mali's mineral sector was dominated by gold mining which, according to the Organisation for Economic Co-operation and Development (2005, p. 297), accounted for about 57% of exports and 11% of the GDP in 2003. Malian gold exports as a percentage of the GDP increased to 15.1% from 2% between 1996 and 2002. Other mineral commodities produced in the country were clay, gypsum, limestone, marble, salt, sand and gravel, and stone for domestic consumption. Despite being able to produce many of the commodities used in the construction sector, the country imported about 70% of its construction material needs, including cement (Organisation for Economic Co-operation and Development, 2005, p. 297).

The Government agency responsible for the mining sector in Mali is the National Directorate for Geology and Mines, which is part of the Ministry of Mines, Energy and Water Resources. Although several old and new gold mines were expected to come into production during the next 2 years, the mining sector was still underdeveloped owing, in part, to the lack of appropriate infrastructure to support mining activities. Institutional reforms to improve the country's infrastructure, however, were underway. In 2003, the Government began the process of revising the Mining Code for the second time since the establishment of the Code in 1991 (African Mining Intelligence, 2004; Organisation for Economic Co-operation and Development, 2004, p. 197).

In terms of its geologic framework, Mali is located on two principal structural units: the West African craton and the Tuareg shield. The geology of the West African craton, which comprises two main outcrops of crystalline rocks (Bougouni and Kenieba) consists of vast gneisso-granitic complexes and Birrimian greenstone belts. The Bagoe belt, which is located within the Bougouni area, extends along the Bagoe River and hosts the Syama gold deposit. The belt consists mainly of schists and greywackes flanked on both sides by andesites and basalts that locally contain jasper. The Kenieba area is formed by marble, greywackes, schists, and several horizons of tourmalinized or gold-bearing sandstones. A northern formation within the Kenieba area comprises andesites, basalts, and a series of sandstones, greywackes, and polymict conglomerates above Birrimian rocks. About 20 kimberlite pipes intrude the Kenieba basement rocks and the Taoudeni Basin. The Taoudeni Basin covers about two-thirds of Mali's territory (Kusnir, 1999).

Most of Mali's mineral deposits occur to the east and west of the country; diamond occurs mainly in the Kenieba area. Iron occurs in various geologic settings and types of deposits, the most important being the oolitic ironstones in the late Proterozoic sediments between the Bafing and the Bakoye Rivers west of Bamako. A manganese deposit consisting of oxides on weathered gondites occurs to the east of the country. Bauxite deposits overlie late Proterozoic to Permian dolerites and occur in the western portion of the country along the Guinean border. The thickness of the bauxite deposits averages about 10 meters (m) and the Al_2O_3 content in these deposits varies from 39% to 48%. Lithium deposits from spodumene-bearing pegmatites occur in the southwest within the Bougouni area. Apatite, mica, niobium (pyrochlore), and rare-earth minerals are found in carbonatites along the eastern edge of the West African craton. Industrial minerals include barite, diatomite, fluorspar, kaolin, limestone, ornamental stone, and salt. Phosphate resources are located to the south and west of the Adrar des Iforas region. Limestone deposits are located in western Mali near the Bamako-Dakar railway southeast of Kayes. The In Kereit gypsum deposit is located north of the Adrar des Iforas. Gypsum also occurs together with salt in the Taoudeni area within Quaternary sabkhas. Lignite and oil shale are said to occur to the west and southeast of the Adrar des Iforas. Birrimian greenstones that cover an area of about 23,000 km^2 host most of Mali's known gold deposits. Primary mineralization is said to be almost exclusively of two types: lode mineralization, with native gold in quartz veins and/or in sulphides disseminated in hosting rocks; and stratabound mineralization in tourmalinized quartzites. Gold also occurs in elluvial and alluvial placers, which are the main source of gold mined by artisans (Kusnir, 1999).

In 2004, at least 21 companies were engaged in gold exploration in Mali. These included Adven Inc. of the United States; Afcan Mali S.A. (a subsidiary of Afcan Mining Corp. of Canada); African Metals Corporation (AMC) of Canada; AfriOre Limited; AngloGold Ashanti Ltd., which was formed by the merger of AngloGold Limited of South Africa and Ashanti Goldfields Ltd. of Ghana in April 2004; Avnel Gold

[1]References that include a section mark (§) are found in the Internet References Cited sections.

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Mining Ltd. of the United Kingdom; Axmin Inc. of Canada; Delta Exploration Inc. of Canada; Etruscan Resources Inc. of Canada; Glencar Mining plc; Golden Star Resources Ltd. (GSR) of the United States; Great Quest Metals Ltd. of Canada; Hyundai Corporation of the Republic of Korea; IAMGOLD Corp. of Canada; Nevsun Resources Ltd. of Canada; North Atlantic Nickel Corp. of Canada; Randgold Resources Ltd. of the United Kingdom; Resolute Mining Limited of Australia; Robex Resources Inc. of Canada; and West Africa Gold Inc.

Malian gold production was primarily from the Kalana, the Morila, the Sadiola Hill, and the Yatela Mines, although some gold [about 60 kilograms per year (kg/yr)] was also produced by artisanal methods. Production at the Kalana underground mine, which had been closed in 1991, restarted in January 2004. The four mines produced a total of 37,912 kilograms (kg) of gold in 2004 (table 1).

Gold production at the Morila open pit gold mine dropped to 15,878 kg in 2004 from 24,696 kg in 2003. Randgold attributed the 35.7% decrease in production to the mining of the lower-grade parts of the ore body and the failure to increase tonnage throughput to process lower-grade ore as a result of the delay in the commissioning of a new plant expansion. Other cited reasons for the decrease in production were unstable milling performance, carbon-in-leach (CIL) tank downtime, unscheduled shutdowns of the pre-CIL circuit, and poor maintenance. The company had planned to increase throughput at the plant in 2004 to 350,000 metric tons per month (t/mo) from 250,000 t/mo. The Morila Mine was owned by Morila S.A. (a subsidiary of Morila Limited of Mali) (80%) and the Government of Mali (20%). Morila Limited was a 50-50 joint venture of AngloGold Ashanti and Randgold. In 2004, total indicated, inferred, and measured resources at Morila were reported to be 33.75 million metric tons (Mt) at a grade of 3.28 grams per metric ton (g/t) gold. Randgold estimated that mining activities at Morila would last until 2008 based on current mining rates and reserves, and that the processing of stockpiles would continue until 2011 (Randgold Resources Ltd., 2005, p. 14-17).

Randgold, through Société des Mines de Loulo, held an 80% interest in the Loulo gold mine, which was under development in 2004. The Loulo gold mine is located near the Faleme River about 350 kilometers (km) west of Bamako, 220 km south of Kayes, and about 96 km from the Sadiola gold mine. It contains two major deposits: Loulo 0 and Yalea. In 2003, the Board of Randgold approved the development of the mine following the completion of a feasibility study and, in 2004, Randgold awarded a contract to BCM Mali S.A. (a subsidiary of BCM International Ltd) for the operation of the mine. The first facility construction works began in October. The mine was scheduled to go into production in mid-2005 and was expected to produce an average of about 6,200 kg/yr of gold. Measured and indicated mineral resources at Loulo 0 were estimated to be about 15.87 Mt at a grade of 4.05 g/t gold, and inferred resources, 1.7 Mt at a grade of 5.24 g/t gold. At Yalea, measured and indicated resources were estimated to be about 15.34 Mt at a grade of 4.05 g/t gold, and inferred resources, 18.76 Mt at a grade of 5.31 g/t gold (Randgold Resources Ltd., 2005, p. 23-25).

SRK Consulting Co. completed a prefeasibility study to examine the potential for the development of two underground mines as deep extensions of the ore bodies below the open pit reserves at Loulo 0 and Yalea. Randgold commissioned SRK Consulting to lead a definitive underground development study of the project based on the potential for positive results yielded by the prefeasibility study. A budget of $7 million was approved for the project (African Mining, 2004; Randgold Resources Ltd., 2005, p. 28).

In June, Randgold announced the sale of its 80% stake in the Syama gold mine to Resolute. Resolute paid Randgold $6 million and assumed liabilities of $7 million. Randgold will receive a royalty on production of $10 per ounce on the first million ounces attributable to Resolute and $5 per ounce on the next 3 million attributable ounces at a gold price of $350 per ounce. The Malian Government held the remaining 20% interest in Syama. The Syama gold mine is located in southern Mali about 300 km southeast of Bamako. The mine was acquired by Randgold in 1996, but operations were suspended in 2001 following a drop in gold prices. Syama was put on care and maintenance status in 2002 (Randgold Resources Ltd., 2004; 2005, p. 32).

Gold production at the Sadiola Hill open pit gold mine increased to 14,277 kg in 2004 from 14,059 kg in 2003. Sadiola Hill was owned by La Société d'Éxploitation des Mines d'Or de Sadiola S.A. (Sadiola) [a joint venture of AngloGold Ashanti (38%), IAMGOLD (38%), the Government of Mali (18%), and the World Bank's International Finance Corporation (6%)]. Total measured and indicated resources at Sadiola were reported to be 39.0 Mt of ore at a grade of 2.8 g/t gold. Total inferred resources were reported to be 64.7 Mt at a grade of 2.4 g/t gold (IAMGOLD Corp., 2005, p. 15). Infill drilling of the sulfide at Sadiola was completed in 2004. AngloGold Ashanti planned to focus exploration on potential oxide targets within the Sadiola concession in 2005 (AngloGold Ashanti Ltd., 2005, p. 41).

Gold production at the Yatela open pit mine, which opened in 2001, was 7,527 kg in 2004 compared with 6,781 kg in 2003. The mine was owned by La Société d'Éxploitation des Mines d'Or de Yatela S.A. (Yatela) [a joint venture of AngloGold Ashanti and IAMGOLD (40% each) and the Government of Mali (20%)]. AngloGold Ashanti was the mine operator. Total measured and indicated resources at Yatela were reported to be 16.6 Mt at a grade of 2.5 g/t gold. Total inferred resources were reported to be 2.9 Mt at a grade of 3.2 g/t gold. IAMGOLD reported that mining operations at Yatela were expected to end by 2007 at current mining rates because the exploration potential at Yatela was limited and significant levels of additional mineral resources were not expected to be found (IAMGOLD Corp., 2005, p. 6).

The Kalana Mine, which was owned by Société de la Mine d'or de Kalana [a joint venture of Avnel (80%) and the Government of Mali (20%)], produced 230 kg of gold in 2004. Production at the redeveloped underground mine, which is located about 300 km south of Bamako, was restarted in January. The mine had been closed in 1991. Avnel expected mine production to increase to its design capacity of 60,000 metric tons per year (t/yr) of ore in 2007 from the 32,000 t/yr of ore produced in 2004 as new mining areas are opened and

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the shaft-deepening to access new veins is completed. During the shortfall in underground production between 2004 and 2006, the company planned to mine gold from surface sources, which included the 10,000 metric tons (t) of coarse sand dumps generated from tailings during 2004 that reportedly contained an average grade of 5.0 g/t gold. A revamped gravity plant was commissioned during the year; the gold recovery rate at the plant ranged between 79% and 84%. Phase 1 of a geochemical soil-sampling program was completed in 2004; Phase 2 was scheduled to be completed in 2005 (Avnel Gold Mining Ltd., 2005§).

The Government awarded five onshore petroleum exploration permits in northern Mali to Baraka Mali Ventures Ltd. of Australia. The permits were for Blocks 1, 2, 3, 4, and 9 within the Taoudeni Basin in the Sahara Desert. Baraka was to invest $51 million over the next 4 years across all five permits (Oil & Gas Journal, 2004).

Outlook

AngloGold Ashanti planned to continue studying identified potential oxide targets at the Sadiola property, but expected production at the Sadiola Mine to decrease by 2% in 2005 compared with that of 2004. At the Yatela property, the company planned to continue to study the potential for sulfide ore below the Alamoutala deposit and expected production at the Yatela Mine to increase by 10%. AngloGold Ashanti also planned to continue exploration drilling at Samacline, which was located west of the Morila pit, and expected its share in production to increase to about 8,000 kg in 2005 compared with about 6,300 kg produced in 2004 (AngloGold Ashanti Ltd., 2005, p. 41-43).

In spite of the favorable production outlook for the Yatela Mine in 2005 and the additional future production that will result from the development of the Kalana and the Loulo Mines, the new production is not likely to counterbalance the loss in production that will result from the eventual depletion through mining of the Morila and the Yatela Mines beyond 2008.

References Cited

African Mining, 2004, Mali: African Mining, v. 9, no. 4, July-August, p. 14.

African Mining Intelligence, 2004, Changes to mining code: African Mining Intelligence, no. 95, October 27-November 9, p. 2.

AngloGold Ashanti Ltd., 2005, 2004 annual report: Johannesburg, South Africa, AngloGold Ashanti Ltd., 186 p.

IAMGOLD Corp., 2005, 2004 annual report: Toronto, Ontario, Canada, IAMGOLD Corp., 60 p.

International Monetary Fund, 2005, Mali—Poverty reduction strategy paper implementation report: Washington DC, International Monetary Fund Country Report No. 05/439, 85 p.

Kusnir, Imrich, 1999, Gold in Mali: Acta Montanistica Slovaca, no. 4, p. 311-318.

Oil & Gas Journal, 2004, Explorers prepare to evaluate Taoudeni basin in Mali and Mauritania: Oil & Gas Journal, December 6, v. 102.45, p. 42-43.

Organisation for Economic Co-operation and Development, 2004, African economic outlook—Mali: Paris, France, Organisation for Economic Co-operation and Development, 450 p.

Organisation for Economic Co-operation and Development, 2005, 2004/2005 African economic outlook—Mali: Paris, France, Organisation for Economic Co-operation and Development, 540 p.

Randgold Resources Ltd., 2004, Randgold wraps up Syama sale: Bamako, Mali, Randgold Resources Ltd. press release, June, 15, 2 p.

Randgold Resources Ltd., 2005, 2004 annual report: St. Helier Jersey, Channel Islands, United Kingdom, Randgold Resources Ltd., 96 p.

Internet References Cited

Avnel Gold Mining Ltd., 2005, Current operations, accessed December 2, 2005, at URL http://www.avnelgold.com/mining_ops/current_ops/current_ops.html.

International Monetary Fund, 2005 (September), Mali, World Economic Outlook Database, accessed November 30, 2005, at URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.

U.S. Central Intelligence Agency, 2004, Mali, World Factbook 2004, accessed March 31, 2005, at URL http://www.cia.gov/cia/publications/factbook/print/ml.html.

MAURITANIA

Mauritania is bounded on the north by Morocco, on the northeast by Algeria, on the west by the Atlantic Ocean, on the east and southeast by Mali, and on the south by Senegal. In 2004, the population was estimated to be about 3.0 million. The country's total land and water area is about 1 million km^2, which is slightly larger than three times the size of New Mexico (U.S. Central Intelligence Agency, 2004§). The country's GDP based on purchasing power parity was estimated to be about $6.4 billion in 2004; the per capita GDP based on purchasing power parity was about $2,200 (International Monetary Fund, 2005§). Mining accounted for about 10% of the GDP and iron ore exports accounted for about 60% of the country's total exports (International Chamber of Commerce, 2004, p. 38).

According to the International Chamber of Commerce (2004, p. 9) Mauritania has been implementing economic, political, and social reforms since 1985. Government policies implemented throughout this period have allowed for state withdrawal from the parapublic sector through privatization, liquidation of nonstrategic public enterprises, suppression of monopolies, and the liberalization of the economy. Initially, the privatization policy was aimed at businesses that held no strategic interest for the country, but eventually in 1999, the Government began privatizing the enterprises it believed to be of strategic interest, such as the telecommunication, air transport, and energy sectors. Foreign direct investment increased from $117 million in 2002 to $214.5 million in 2003; the increase was attributed to Government concessions and incentives, an improved macroeconomic framework, and petroleum development. About $50 million has been invested in mining during the past 5 years and about $200 million has been invested in petroleum exploration. As of 2004, a total of 65 exploration permits were active, 33 of which were for diamond; 24, for gold and base metals; and 4, for petroleum (International Chamber of Commerce, 2004, p. 15).

Mauritania's mineral sector was dominated by iron ore mining and beneficiation. Most of the iron ore produced in the country was exported to Belgium, France, Germany, and Italy. Other commodities produced in Mauritania included cement, gypsum, and salt.

The Ministère des Mines et de l'Industrie is the Government agency responsible for the mining industry. Société Nationale Industrielle et Minière (SNIM) was responsible for iron ore production and beneficiation. The company operated a mining center at the northern town of Zouerate, three open pit iron ore mines at Guelb El Rhein, Kedia d'Idjill, and M'Haoudat in northern Mauritania, port facilities at Nouadhi on the Atlantic coast, and

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a 700-km-long railway that linked the mining center to the port facilities (Société Nationale Industrielle et Minière, 2005§).

In September, Rio Narcea Gold Mines Ltd. acquired Defiance Mining Corporation of Canada and its Tasiast gold project in Mauritania. A bankable feasibility study for the Tasiast project had been completed in April. Measured and indicated mineral resources at Tasiast were estimated to be about 12 Mt at a grade of 3.06 g/t gold, and inferred mineral resources were estimated to be about 12 Mt at a grade of 2.25 g/t gold. Engineering and construction contracts for the project were to be finalized in 2005, with construction work expected to begin in the second quarter of 2005 and production to begin by the end of 2006. According to Rio Narcea, the mine was expected to process an average of 1.12 million metric tons per year (Mt/yr) of ore over a 9-year mine life. The company planned to mine the oxide ore during the first 3 years at an average rate of about 1.22 Mt/yr of ore and to produce about 3,400 kg/yr (reported as 110,000 troy ounces per year) of gold (Rio Narcea Gold Mines Ltd., 2005, p. 4, 12-13).

Iron ore that contained about 65% iron was mined from the Kedia d'Idjill Mine and the M'Haoudat Mine, while lower-grade ore that contained about 37% iron was mined from the Guelb El Rhein Mine (Société Nationale Industrielle et Minière, 2005§). SNIM produced 11 Mt of iron ore in 2004 compared with about 10.4 Mt in 2003. Sphere Investments Ltd. of Australia (SIL) continued working on the Guelb el Aouj iron ore project during the year. SIL, which had signed a joint-venture agreement with SNIM in October 2001 for the development of a new 18-Mt/yr iron ore mine, a concentration plant, and a 7-Mt/yr pelletizing plant to produce direct-reduction-grade pellets for export, was to spend $11 million on a bankable feasibility study to earn a 50% interest in the project.

The work program for Stage 1 of the project, which included aerial survey and mapping, drilling, hydrogeology, marketing, metallurgical testwork, and relogging of existing drill cores, was completed in 2004. According to company reports, as of October 2004, inferred magnetite-quartzite resources were estimated to be 225 Mt containing 36% iron (Sphere Investments Ltd., 2005, p. 2-5).

First Quantum Minerals Ltd. of Canada signed a Heads of Agreement with the Government of Mauritania for the acquisition of an 80% interest in the Guelb Moghrein copper-gold deposit. Under the agreement, a new company will be created, and the remaining 20% will be owned by Guelb Moghrein Mines d'Akjoujt S.A. The Guelb Moghrein deposit is located in the Inchiri region near the town of Akjoujt about 250 km northeast of Nouakchott. First Quantum was assessing the project's potential to support an operation that will produce about 30,000 t/yr of copper and about 1,600 kg/yr (reported as 50,000 troy ounces per year) of gold in the form of copper-gold concentrates that will be exported to smelters in Asia and Europe. The company expected to begin production by the fourth quarter of 2005 (First Quantum Minerals Ltd., 2004).

Rex Diamond Mining Corporation of Canada (RDM) ended its diamond exploration activities in Mauritania in August 2004 citing disappointing geophysical survey exploration results (African Mining Intelligence, 2004; Rex Diamond Mining Corporation, 2005, p. 9).

Several international oil companies, mainly Australian, were involved in offshore exploration in Mauritania in 2004. Previous exploration efforts had resulted in a series of discoveries, including the Chinguetti oilfield in 2001, the Banda oilfield in 2002, and the Tiof oilfield in 2003. Woodside Petroleum Ltd. of Australia held a 53.846% interest through production-sharing contracts in all three of these oilfields. Phase 1 of the Chinguetti project was scheduled to be completed and to produce the first petroleum by 2006 with petroleum production averaging 75,000 barrels per day (bbl/d). The Banda oilfield is located within the company's production-sharing contract for area A (PSC-A); Chinguetti and Tiof are located within the production-sharing contract area B (PSC-B). The remaining partners in PSC-A were Hardman Resources Ltd. (24.3%), BG Group plc (13.084%), Fusion Oil and Gas Company (4.615%), and Roc Oil Ltd. (4.155%); the remaining partners in PSC-B were Hardman Resources (21.6%), BG Group (11.63%), Premier Oil plc (9.231%), and Roc Oil (3.693%) (Oil & Gas Journal, 2004b; Woodside Petroleum Ltd., 2004, 2004§). In 2004, the Government awarded onshore exploration blocks for the Taoudeni Basin in northern Mauritania to China National Petroleum Company, Repsol YPF SA, Total S.A., and Woodside (Oil & Gas Journal, 2004a).

In terms of the country's basic infrastructure, about 2,100 km of the country's 10,282 km of roads was paved, 982 km was dirt road, and 7,200 km was track. Construction of the Nouadhibou-Nouakchott and Rosso-Boghe roads and a new airport at Nouakchott were underway. Mauritania had four international airports and a deep-sea harbor at Nouakchott. SNIM owned a separate harbor for exporting iron ore, and negotiations were underway with Chinese interests for the construction of a fourth dock at Nouakchott Port (International Chamber of Commerce, 2004, p. 16).

References Cited

African Mining Intelligence, 2004, Rex Diamond backs away: African Mining Intelligence, no. 91, September 1-14, p. 1.

First Quantum Minerals Ltd., 2004, Mauritania approves First Quantum Minerals acquisition of an 80% interest in Guelb Moghrein copper-gold deposit: Vancouver, British Columbia, Canada, First Quantum Minerals Ltd. press release, July 14, 2 p.

International Chamber of Commerce, 2004 (March), An investment guide to Mauritania: New York, New York, International Chamber of Commerce, 62 p.

Oil & Gas Journal, 2004a, Explorers prepare to evaluate Taoudeni basin in Mali and Mauritania: Oil & Gas Journal, December 6, v. 102.45, p. 42-43.

Oil & Gas Journal, 2004b, Mauritania's offshore: Oil & Gas Journal, v. 102.10, March 8, p. 43.

Rex Diamond Mining Corporation, 2005, 2004 annual report: Toronto, Ontario, Canada, Rex Diamond Mining Corporation, 40 p.

Rio Narcea Gold Mines Ltd., 2005, 2004 annual report: Toronto, Ontario, Canada, Rio Narcea Gold Mines Ltd., 84 p.

Sphere Investments Ltd., 2005, 2004 annual report: Perth, Australia, Sphere Investments Ltd., 57 p.

Woodside Petroleum Ltd., 2004, Mauritania offshore drilling update: Perth, Australia, Woodside Petroleum Ltd. press release, December 21, 2 p.

Internet References Cited

International Monetary Fund, 2005 (September), Mauritania, World Economic Outlook Database, accessed November 30, 2005, at URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.

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Société Nationale Industrielle et Minière, 2005, SNIM, a modern company in the heart of the Sahara, accessed December 7, 2005, at URL http://www.snim.com.
U.S. Central Intelligence Agency, 2004, Mauritania, World Factbook 2004, accessed March 31, 2005, at URL http://www.cia.gov/cia/publications/factbook/print/mr.html.
Woodside Petroleum Ltd., 2004, Projects—Mauritania, accessed December 11, 2005, at URL http://www.woodside.com.au/Regions/Africa/Projects/Chinguetti+Mauritania.htm.

NIGER

Niger is a landlocked African country bordered by Algeria, Benin, Burkina Faso, Chad, Libya, Mali, and Nigeria. The country's 11.4 million inhabitants share a total land area of about 1.3 million square kilometers. In 2004, the country's GDP based on purchasing power parity was estimated to be $10.5 billion and the per capita GDP based on purchasing power parity was $865 (U.S. Central Intelligence Agency, 2004§; International Monetary Fund, 2005§).

The mineral commodities produced in Niger were cement, coal, gold, gypsum, limestone, salt, tin, and uranium. In 2004, Niger was the world's fourth ranked producer of uranium after Canada, Australia, and Kazakhstan (Uranium Information Centre Ltd., 2005§). Production of uranium rose to 3,282 t in 2004 from 3,143 t in 2003 (table 1). Niger's main uranium resources are located within the sedimentary layers of the Iullemmeden Basin. Production of uranium came from two mines: the Akouta underground mine, which was operated by Compagnie Minière d'Akouta (COMINAK), and the Arlit open pit mine, which was operated by Société des Mines de l'Aïr (SOMAIR). COMINAK was owned by Compagnie Générale des Matières Nucléaires (COGEMA) of France (34%), the Government of Niger (31%), Overseas Uranium Resources Development Company of Japan (25%), and ENUSA Industrias Avanzadas, S.A. of Spain (10%). SOMAIR was owned by COGEMA (56.86%), the Government of Niger (36.6%), and Urangesellschaft GmbH of Germany (6.54%) (Antenna Netherlands, 2004§; World Nuclear Association, 2004§). Production at SOMAIR came from the Arlette, Takriza, Tamou, and Taza deposits. The company's Arlit mill, which had a uranium production capacity of 2,300 t/yr, remained partially operational during the year. Sulfuric acid was produced at the mill using imported sulfur. COMINAK's Akouta mill had a uranium production capacity of 2,500 t/yr, and sulfuric acid was also produced at this mill using imported sulfur (World Nuclear Association, 2004§).

The Samira Hill gold mine was commissioned during the third quarter of 2004. The mine produced a total of 669 kg (reported as 21,521 troy ounces) of gold during its first three months of operation in addition to the 15 kg (reported as 485 troy ounces) of gold produced during the the mine's preproduction period (Etruscan Resources Inc., 2005, p. 4; Semafo Inc., 2005, p. 1). The company that operated the Samira Hill Mine was Société des Mines du Liptako SA (SML), which was a limited-liability company owned by African GeoMin Mining Development Corporation Ltd. (AGMDC) (80%) and the Government of Niger (20%). AGMDC was, in turn, owned by Etruscan Resources (50%) and Semafo Inc. (50%). Samira Hill was located about 90 km west of the capital city of Niamey (African Mining, 2004). The two main deposits in the property were the Libiri and the Samira Hill deposits. Total measured and indicated resources at Libiri and Samira Hill were reported to be about 25.4 Mt at a grade of 1.85 g/t gold (Semafo Inc., 2005, p. 8, 12).

PETRONAS Carigali Niger Exploration and Production Ltd. [a subsidiary of Petroliam Nasional Berhad (PETRONAS) of Malaysia and Exxon Mobil Corp.] began a three-well drilling program in the Agadem Basin in September 2004. ExxonMobil and PETRONAS each held a 50% interest in the Agadem Block 1 permit. Previous exploration in the Basin had confirmed oil reserves of about 300 million barrels (Africa Energy Intelligence, 2004).

In January 2004, TG World Energy Corporation of Canada filed conciliation proceedings with the World Bank International Centre for the Settlement of Investment Disputes after the Government of Niger canceled its contract on the Tenere block and awarded the exploration rights to China National Petroleum Company (CNPC). The dispute was settled in favor of TG World, which obtained a 20% share of CNPC's participation in the acreage. The Tenere block is located within the Agadem Basin next to the Agadem block, which is held by PETRONAS and ExxonMobil (Africa Energy Intelligence, 2004; Oil & Gas Journal, 2004).

References Cited

Africa Energy Intelligence, 2004, Explorers hard at work: Africa Energy Intelligence, no. 376, September 8-21, p. 3.
African Mining, 2004, Samira Hill project on course for September start-up: African Mining, v. 9, no. 3, p. 42-43.
Etruscan Resources Inc., 2005, 2004 annual report: Windsor, Nova Scotia, Canada, Etruscan Resources Inc., 40 p.
Oil & Gas Journal, 2004, Agadem basin, Niger: Oil & Gas Journal, v. 102.10, p. 43.
Semafo Inc., 2005, 2004 annual report: Saint Laurent, Quebec, Canada, Semafo Inc., 64 p.

Internet References Cited

Antenna Netherlands, 2004, Uranium mine ownership—Africa, accessed January 11, 2004, at URL http://www.antenna.nl/wise/uranium/uoafr.html#AKOUTA.
International Monetary Fund, 2005 (September), Niger, World Economic Outlook Database, accessed November 30, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.
Uranium Information Centre Ltd., 2005, World uranium mining, accessed December 12, 2005, at URL http://www.uic.com.au/nip41.htm.
U.S. Central Intelligence Agency, 2004, Niger, World Factbook 2004, accessed March 31, 2005, at URL http://www.cia.gov/cia/publications/factbook/print/ng.html.
World Nuclear Association, 2004, Uranium mining in Niger—status and perspectives of a top five producing country, accessed December 12, 2005, at URL http://www.world-nuclear.org/sym/2004/souley.htm.

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TABLE 1
MALI, MAURITANIA, AND NIGER: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2000	2001	2002	2003[e]	2004[e]
MALI[2]						
Gold, mine output, gold content	kilograms	28,717 [3]	42,288 [3]	56,043 [3]	45,535 [4]	37,974 [4]
Gypsum[e]		500	500	500	500	500
Salt[e]		6,000	6,000	6,000	6,000	6,000
MAURITANIA[5]						
Cement		120,000	200,000	200,000 [e]	200,000	200,000
Gypsum[e]		100,000	100,000	100,000	34,264 [r, 4]	38,940 [4]
Iron ore:						
Gross weight[6]	thousand metric tons	11,345	10,302	9,553	10,377 [r, 4]	11,000 [4]
Iron content[e]	do.	7,500	6,700	6,200	6,890	7,200
Petroleum refinery products:[e]						
Liquefied petroleum gas	thousand 42-gallon barrels	440	440	-- [4]	--	--
Gasoline	do.	1,900	1,900	-- [4]	--	--
Kerosene	do.	470	470	-- [4]	--	--
Distillate fuel oil	do.	1,100	1,100	-- [4]	--	--
Residual fuel oil	do.	2,450	2,450	-- [4]	--	--
Other	do.	700	700	-- [4]	--	--
Total	do.	7,060	7,060	-- [4]	--	--
Salt[e]		5,500	5,500	5,500	15 [r, 4]	20 [4]
Steel, crude		5,000	5,000 [e]	5,000 [e]	5,000	5,000
NIGER[7]						
Cement, hydraulic[e]		40,000	40,000	40,000	40,000	40,000
Coal, bituminous		158,200	163,275	182,916	183,000	183,000
Gold[8]	kilograms	25	30	28	30 [r]	684 [4]
Gypsum		1,474	3,205	17,652	17,700	17,700
Limestone		60,535	103,726	146,399	146,000	146,000
Salt[e]		2,000	2,000	2,000	2,000	2,000
Sulfuric acid:						
Gross weight		52,000	55,000	62,000	67,000 [4]	70,000 [p, 4]
Sulfur content		17,000	18,000	20,000	22,000 [r, e]	23,000
Tin, mine output, Sn content		22	9	11	11	3,100
Uranium, U content		2,898	2,920	3,076	3,143 [4]	3,282 [4]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. -- Zero.

[1]Table includes data available through November 2005.

[2]In addition to the commodities listed, Mali produced clays, sand and gravel, and stone for local construction purposes in addition to diamond, marble, silver, and tin, but information is inadequate to make reliable estimates of output levels.

[3]Excludes artisanal production, which is estimated to be about 2,000 kilograms per year.

[4]Reported figure.

[5]In addition to the commodities listed, modest quantities of crude construction materials (clays, sand and gravel, and stone) presumably were produced, but output was not reported quantitatively. The minimill of Société Arabe de Fer et d'Acier en Mauritanie produced rebar and wire, but available information is inadequate to make reliable estimates of output levels.

[6]Reported by National Industrial and Mining Company.

[7]In addition to the commodities listed, phosphate rock, tungsten ore, and a variety of construction materials (clays, sand and gravel, and stone) were produced, but information is inadequate to make reliable estimates of output levels.

[8]Does not include unreported production; total output of gold was estimated to be roughly 1,000 kilograms per year.

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The Mineral Industries of Morocco and Western Sahara

By Omayra Bermúdez-Lugo

MOROCCO

Morocco is located in northern Africa and is bordered by Algeria to the east, the Atlantic Ocean to the west, the Mediterranean Sea to the north, and Western Sahara to the south. In 2004, the country's 30.6 million inhabitants shared a land area of about 446,300 square kilometers (km^2) (U.S. Central Intelligence Agency, 2005§; World Bank Group, The, 2005§[1]). Morocco was the world's third ranked producer of phosphate rock after the United States and China. In addition to phosphate rock, the country produced a wide variety of minerals, which included barite, clays, coal, cobalt, copper, fluorspar, gold, iron ore, lead, nickel, petroleum, salt, silver, talc, and zinc. In 2004, Morocco's gross domestic product (GDP) based on purchasing power parity was estimated to be about $129 billion; the per capita GDP based on purchasing power parity was $4,332. According to the Moroccan Federation of the Mineral Industry, mining and mining related activities contributed about 6% to the GDP and represented about 75% of all tonnage exported by sea, 70% of all tonnage transported by rail, and 20% of foreign trade (Federation of the Mineral Industry, 2004, p. 11; International Monetary Fund, 2005§; Jasinski, 2005§).

Government Policies and Programs

In 2004, Morocco undertook a program of institutional reforms in the transportation sector. The Transport Sector Reform Program received a $298 million[2] loan in December from the African Development Bank to help fund the program, which was aimed at liberalizing the sector and attracting private investors to develop air, maritime, railway, and road transportation (afrol News, 2004§).

Trade

According to Morocco's Department of Statistics preliminary estimate, total Moroccan exports were valued at about $9.5 billion in 2004 compared with about $8.8 billion in 2003. Phosphate rock exports, which were valued at $442 million, accounted for about 4.6% of total exports compared with a revised $362 million in 2003. Phosphoric acid exports, which were valued at $721 million, accounted for about 7.6% of total exports compared with a revised $507 million in 2003 (Direction de la Statistique, 2005§). According to the U.S. Census Bureau, Moroccan exports to the United States were valued at $515 million in 2004 compared with $385 million in 2003. These included more than $118 million of petroleum products, more than $79 million of nonmetallic minerals, about $10 million of semifinished iron and steel mill products, and $167,000 of organic chemicals and fertilizers. Imports from the United States were valued at about $526 million in 2004 compared with more than $468 million in 2003. These included about $21 million of coal and more than $5 million of petroleum products (U.S. Census Bureau, 2005a§, b§).

Morocco and the United States signed a free trade agreement in June 2004. The agreement will allow for the elimination of tariffs on 95% of all bilateral consumer and industrial exports, and all remaining tariffs are to be eliminated within 9 years. Morocco was to provide immediate duty-free access to 92% of Moroccan nonagricultural and nontextile imports from the United States. Most U.S. exports of capital-intensive machinery, chemicals, civil aircraft, and construction and medical equipment will qualify for immediate duty-free access once the agreement is in force. Before the signing of the agreement, Morocco already benefited from the Generalized System of Preferences, which grants duty-free access to the U.S. market in a broad range of product categories, including that for Moroccan phosphate exports. The United States-Morocco Free Trade Agreement was scheduled to be implemented in 2005 (Office of the United States Trade Representative, 2004§; U.S. Commercial Service, 2005§).

Structure of the Mineral Industry

The Office National des Hydrocarbures et des Mines (ONHYM) was the Government entity responsible for the exploration for and the promotion of national mineral resources. State-owned Office Chérifien des Phosphates (OCP) managed phosphate mining and beneficiation and owned most of the phosphoric acid and phosphate fertilizer production facilities. Groupe ONA of Morocco was the leading indirect private sector investor through its equity interest in Managem S.A. and Société Nationale d'Ivestissement S.A. (SNI). Managem had six mines in Morocco: the Akka gold mine, the Bou-Azzer cobalt mine, the Draa Sfar and the Guemassa copper-lead-zinc mines, El Ham mam fluorspar mine, and the Imiter silver mine (Mining Review Africa, 2005).

Commodity Review

Metals

Cobalt.—Compagnie de Tifnout Tiranimine (CTT), which was a subsidiary of Managem, mined cobalt ore at Bou-Azzer. Cobalt concentrates and tailings from Bou-Azzer were refined at the Guemassa plant. The Guemassa plant also produced about 6,000 metric tons per year (t/yr) of arsenic trioxide (Mining Review Africa, 2005, p. 10-11).

Copper.—Odyssey Resources Ltd. of Canada signed an agreement with the Government to acquire 34 exploration licenses that total 392 km^2 in Morocco's copper-silver district.

[1]References that include a section mark (§) are found in the Internet References Cited sections.

[2]Where necessary, values have been converted from Moroccan dirhams (DH) to U.S. dollars (US$) at the average exchange rate of DH9.0465=US$1.00 for 2004 and DH9.5744=US$1.00 for 2003.

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The properties are located in southwestern Morocco within the Anti Atlas Mountains. The agreement to acquire 17 of the 34 exploration licenses entailed expenditures totaling $1.45 million over a period of 4 years and cash payments of about $16.5 million over an additional 4-year period. Odyssey will own 100% of all claims subject only to a 3% net smelter return royalty (Odyssey Resources Ltd., 2004§).

Gold.—Gold exploration activities in 2004 included the Tafrent gold project, which was at a feasibility stage, and the Imawn gold project, which was at a drilling and resource identification stage (Mining Review Africa, 2004§).

Lead and Zinc.—Compagnie Minière de Guemassa (CMG), which was a subsidiary of Managem, operated the underground polymetallic Hajar Mine at Guemassa. Ore was crushed prior to conveying it to the surface, stored in silos, and then milled before being sent to an automated differential flotation circuit for the production of copper, lead, and zinc concentrates. The concentrates were then thickened and filtered to produce marketable concentrates and transported 200 kilometers (km) to the Port of Safi for export. The company's second polymetallic mine, the Draa Sfar Mine, began operating in 2004 and produced an average of 2,200 metric tons per day (t/d) of ore. Ore from the Draa Sfar Mine was crushed onsite and then transported to the Guemassa Mine for milling. The estimated life of the Draa Sfar Mine was 10 years. Managem's industrial processing complex at Guemassa produced about 160,000 metric tons (t) of zinc concentrates, 30,000 t of lead, and 10,000 t of copper concentrates annually (Mining Review Africa, 2005, p. 10).

Silver.—Silver in Morocco occurs both as the primary mineral in ore deposits at Igoudrane and Imiter and as a byproduct of cobalt, copper, lead, and zinc mining operations. Most of the country's silver production came from the Imiter Mine, which was owned and operated by Société Metallurgique d'Imiter (SMI) (a subsidiary of Managem). Imiter Mine, which is located about 150 km east of Ouarzazate on the northern side of Saghro Mountain, mines about 300,000 t/yr of ore and has a production capacity of about 250 t/yr of 99.7% pure silver in the form of anodes and bullion. At Igoudrane, resources have been estimated to be 500,000 t containing 730 grams per metric ton (g/t) silver (Mining Review Africa, 2004§).

Industrial Minerals

Bentonite.—In March 2004, S&B Industrial Minerals S.A. of Greece, through its subsidiary North African Industrial Minerals Exploration, signed an agreement with the Moroccan Bureau de Recherches et de Participation Minières for the acquisition of four mining exploration and exploitation licenses for bentonite deposits in Morocco. The company planned to conduct geophysic studies and a drilling program to identify potential reserves (Industrial Minerals, 2004b; S&B Industrial Minerals S.A., 2004).

Cement.—The Moroccan cement industry comprised four companies: Asment de Temara; Holcim (Maroc) S.A.; Lafarge S.A. (Lafarge) through Lafarge Ciments (Maroc), which was a 50% owned subsidiary of the Lafarge Group of France; and Société les Ciments du Maroc S.A. Lafarge Ciments, which operated the Bouskoura, the Meknes, the Tangiers, and the Tetouan cement plants, planned to build a new production line at Bouskoura, which will increase production capacity by 900,000 t/yr to 3.1 million metric tons per year (Mt/yr). Production was scheduled to start at the beginning of 2006 (Lafarge S.A., 2004c). In Morocco, coal-fired powerplants were estimated to generate about 570,000 t/yr of fly ash, including 400,000 t/yr recovered as dry matter. Lafarge Ciments had a contract with the Jorf Lasfar Energy Company to purchase the fly ash and reuse it as a cement additive at the Bouskoura cement plant. Cement produced at Bouskoura had a fly ash content of about 6.5% (Lafarge S.A., 2004§).

In May 2004, Lafarge Ciments opened a new cement plant in Tetouan with a production capacity of 1 Mt/yr. The new plant, Tetouan-2, replaced an existing unit that had been transformed into a lime-processing facility. Tetouan-2 was designed to accommodate a second production line if needed. About 40% of the plant's electricity needs will be generated by windmills. The construction of a wind farm was contracted to Compagnie du Vent of France, which expected to begin supplying electricity to the plant in 2005 (Lafarge S.A., 2004a, b; North Africa Journal, The, 2004§).

Société Holcim (Maroc) S.A., which operated two cement plants and two clinker-grinding mills in Morocco, planned to build a new cement plant in Settat, which is located about 70 km south of Casablanca. The plant, which will have an annual capacity of 1.7 Mt/yr, was scheduled to come online in 2008 and would cost about $259 million (International Cement Review, 2004; Middle East Economic Digest, 2004a).

Diamond.—In May 2004, Metalex Ventures Ltd. of Canada signed an exploration agreement with ONHYM to conduct preliminary diamond exploration in southern Morocco. The concession included in the exploration agreement is for an area of 24,800 km^2 of Archean cratonic and Proterozoic rocks, which the company considered to be highly prospective for diamond-bearing kimberlite and for base and precious metals, including platinum-group metals and iron ore. In 2004, 942 loam and drainage samples were collected and sent to Canada's CF Mineral Research Ltd.'s laboratory in British Columbia for base- and precious-metal analysis (Metalex Ventures Ltd., 2004).

Fluorspar.—Société Anonyme d'Enterprises Minières (Samine), which was a subsidiary of Managem, operated El Hammam fluorspar mine (Mining Review Africa, 2005, p. 10). The mine produced 112,100 t of acid-grade fluorspar in 2004 (table 1).

Phosphate Rock.—OCP mined phosphate ore from Benguerir, Khouribga, and Youssoufia. The company's Khouribga operations were spread out over a radius of 30 km and included three mines: Sidi Chennane Mine, Mera El Arech Mine, and Sidi Daoui Mine, which had production capacities of 8 Mt/yr, 6 Mt/yr, 4 Mt/yr, respectively. Sidi Daoui Mine was being gradually depleted of ore. Operations at Khouribga switched from underground methods to open pit methods in 1993. Phosphate deposits were found in layered units ranging from less than 1 meter (m) to 4 m in thickness, and were covered by between 12 and 15 m of overburden. Once the overburden was removed, the material was drilled, blasted, and carried out by drag lines. Trucks carried the material to a

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crushing and screening facility where the ore was first screened to 90 millimeters (mm), and then to 15 mm, and was then sent via a from 25- to 30-km-long conveyor to a beneficiation plant. The phosphate product with a size of between 40 and 125 microns was sent to a washing plant where it was separated from the slime. The wet product was pumped to basins about 2 km away for storage before being conveyed to the drying plant. The washing plant had a capacity of 6 Mt/yr, a dry beneficiation capacity of 2.4 Mt/yr, a calcination capacity of 200,000 t/yr, and a drying capacity of 18 Mt/yr. About 50% of OCP's output was processed domestically, and the remaining 50% was exported, with Asia being the leading importer. India was one of the major importers of phosphoric acid. Phosphate was exported through an OCP-operated port terminal at Casablanca that had an export capacity of 14 Mt/yr and through the Port of Layounne (Industrial Minerals, 2004a).

The Government was considering cooperative ventures with foreign companies to develop the phosphates industry further. In July, the Government signed a 50-50 joint-venture agreement with the Fauji Fertiliser Bin Qasim Ltd. of Pakistan to develop a 375,000-t/yr phosphoric acid plant in Jorf Lasfar at a cost of about $200 million. The plant, which will use about 1.3 Mt/yr of phosphate rock from OCP's Khouribga Mine, was scheduled to be completed by 2007 and will feed Fauji's 450,000-t/yr diammonium phosphate plant in Pakistan. Other foreign companies interested in establishing joint ventures with OCP were Chambal Fertilisers and Chemicals Limited of India, Chemische Fabrik Budenheim KG of Germany, Société Regionale d'Investissement de Wallonie of Belgium, and Zuari Industries Limited of India (Middle East Economic Digest, 2004b).

In December 2004, OCP and Bunge Fertilizantes S.A. of Brazil signed a memorandum of understanding to undertake an engineering study for the construction of a joint-venture integrated phosphates fertilizer and phosphoric acid plant at Jorf Lasfar. Investment in the project was estimated to be $265 million. OCP and Bunge Fertilizantes had agreed in May on a long-term strategic alliance under which OCP would supply about 70% of Bunge's phosphate import requirements for the Latin America market. OCP exports to Brazil have doubled in the past 2 years (Arabic News.com, 2004§; Fertilizer Week Online, 2004§).

Mineral Fuels

According to the U.S. Energy Information Administration, Morocco had proven oil reserves of about 2 million barrels and gas reserves of about 43 billion cubic feet. The country produced small volumes of natural gas and petroleum from the Essaouira Basin and small amounts of gas from the Gharb Basin. Morocco was a transit center for Algerian gas exports to Spain and Portugal; exports were transported across the Strait of Gibraltar via the Maghreb-Europe Gas (MEG) pipeline. Morocco had two refineries with a combined capacity of about 155,000 barrels per day. The refineries were located at Mohammedia and Sidi Kacem. In 2004, the Samir refinery returned to near-full-capacity output levels when repairs needed to fix damage caused by a severe flood and massive fire in November 2002 were completed. Among the foreign companies engaged in exploration in 2004 were Maersk Olie og Gas AS of Denmark, which signed an 8-year agreement for eight blocks north of Tarfaya; Norsk Hydro of Norway, which signed a 12-month exploration contract for the Safi offshore northwestern zone; Offshore Oil Corporation of China, which received a license to drill near Agadir; and Stratic Energy Corporation of Canada, which had a 3-year exploration program for two onshore blocks in northwestern Morocco (U.S. Energy Information Administration, 2005§).

Infrastructure

The Moroccan Government's National Electricity Office awarded three contracts worth $6.6 million to Instalaciones Inabensa S.A. of Spain for rural electrification projects in the southern regions of Agadir and Chtouka Aït Baha. Morocco had launched the rural electrification program in 1996 to bring power to more than 34,000 towns and villages by 2007 (African Energy, 2004).

References Cited

African Energy, 2004, Morocco—ONE awards Spanish firms further rural electrification contracts: African Energy, no. 77, August, p. 15.

Federation of the Mineral Industry, 2004, Morocco, a reliable first-class partner in the mining sector: Casablanca, Morocco, Federation of the Mineral Industry, 34 p.

Industrial Minerals, 2004a, Morocco—Feeding demand for phosphates: Industrial Minerals, no. 440, May, p. 72.

Industrial Minerals, 2004b, S&B acquires Moroccan bentonite rights: Industrial Minerals, no. 440, May, p. 13.

International Cement Review, 2004, Holcim builds new Moroccan plant: International Cement Review building bulletin, November, no. 79, p. 1.

Lafarge S.A., 2004a, A world first—A cement plant directly supplied by a wind farm: Paris, France, Lafarge press release, August 13, 1 p.

Lafarge S.A., 2004b, Lafarge inaugurates an ultra modern cement plant in Tetouan, Morocco: Paris, France, Lafarge press release, June 7, 1 p.

Lafarge S.A., 2004c, Lafarge to build a new production line in Bouskoura, Morocco: Paris, France, Lafarge press release, March 29, 1 p.

Metalex Ventures Ltd., 2004, Metalex Ventures Ltd.—Exploration update: Kelowna, British Columbia, Canada, Metalex Ventures Ltd. press release, October 25, 5 p.

Middle East Economic Digest, 2004a, Holcim plans new cement plant: Middle East Economic Digest, v. 48, no. 49, p. 19.

Middle East Economic Digest, 2004b, Moroccan phosphates—Cornering the market: Middle East Economic Digest, v. 48, no. 48, p. 40.

Mining Review Africa, 2005, Managem's global expansion begins in West Africa: Mining Review Africa, no. 2, p. 10-15.

Organisation for Economic Co-operation and Development, 2005, 2004/2005 African economic outlook: Paris, France, Organisation for Economic Co-operation and Development, 540 p.

S&B Industrial Minerals S.A., 2004, S&B Industrial Minerals S.A. obtains mining rights for bentonite in Morocco: Kifissia, Greece, S&B Industrial Minerals S.A. press release, March 29, 1 p.

Internet References Cited

afrol News, 2004, Morocco liberalizes transport sector, accessed May 11, 2005, at URL http://www.afrol.com/articles/14909.

Arabic News.com, 2004, Moroccan phosphates and Brazilian fertilizers firms mull $265 million joint venture, accessed October 19, 2005, at URL http://www.arabicnews.com/ansub/Daily?Day/041201/2004120123.html.

Direction de la Statistique, 2005, Opérations avec l'extérieur, accessed October 3, 2005, at URL http://www.statistic-hcp.ma/morocco11.html.

Digitized by Google

Fertilizer Week Online, 2004, Daily update—Phosphates—North Africa, Morocco, accessed December 8, 2004, at URL http://www.fertilizerweek.com.
International Monetary Fund, 2005, Morocco, World Economic Outlook Database, accessed September 29, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.
Jasinski, S.M., 2005, Phosphate rock, *in* Metals and minerals, v. I of U.S. Geological Survey Minerals Yearbook 2004, accessed September 29, 2005, at URL http://minerals.usgs.gov/minerals/pubs/commodity/phosphate_rock/phospmcs05.pdf.
Lafarge S.A., 2004, Bouskoura—Recycling fly ash, accessed October 5, 2005, at URL http://www.lafarge.com/cgibin/lafcom/jsp/pratic.do?oid=536879021&function=pratiques&BV_SessionID=@@@@1104532480.1129593132@@@@&BV_EngineID=ccccaddfhekkmekcfngcfkmdhgfdggg.
Mining Review Africa, 2004, Morocco's mining sector, accessed March 10, 2005, at URL http://www.miningreview.com/archive/mra_4_2004/46_1.php.
North Africa Journal, The, 2004 (June 5), Lafarge opens new cement plant in Tetouan, Morocco, accessed November 26, 2004, at URL http://www.north-africa.com/147.htm.
Odyssey Resources Ltd., 2004, Anti Atlas copper-silver project, accessed January 5, 2005, at URL http://www.odyssey.resources.com/Anti-Atlas.htm.
Office of the United States Trade Representative, 2004, United States and Morocco sign historic free trade agreement, accessed October 4, 2005, at URL http://www.ustr.gov/Document_Library/Press_Releases/2004/June/United_States_Morocco_Sign_Historic_Free_Trade_Agreement.html.
U.S. Census Bureau, 2005a, U.S. exports from Morocco from 2000 to 2004 by 5-digit end-use code, accessed October 4, 2005, at URL http://www.census.gov/foreign-trade/statistics/product/enduse/exports/c7140.html.
U.S. Census Bureau, 2005b, U.S. imports from Morocco from 2000 to 2004 by 5-digit end-use code, accessed October 4, 2005, at URL http://www.census.gov/foreign-trade/statistics/product/enduse/imports/c7140.html.
U.S. Central Intelligence Agency, 2005 (February 10), Morocco, World Factbook 2004, accessed March 31, 2005, at URL http://www.cia.gov/cia/publications/factbook/geos/mo.html.
U.S. Commercial Service, 2005, U.S.–Morocco free trade agreement, accessed October 4, 2005, at URL http://www.buyusa.gov/morocco/en/33.html.
U.S. Energy Information Administration, 2005 (June), Arab Maghareb Union, Country Analysis Brief, accessed October 4, 2005, at URL http://www.eia.doe.gov/emeu/cabs/maghreb.html.
World Bank Group, The, 2005, Morocco data profile, accessed November 10, 2005, at URL http://www.worldbank.org/external/CPProfile.asp?PTYPE=CP&CCODE=MAR.

WESTERN SAHARA

According to the U.S. Department of State (2005§), the issue of sovereignty over Western Sahara remained unresolved in 2004. The territory, a desert area that borders the Atlantic Ocean between Mauritania and Morocco, is contested by Morocco and the Popular Front for the Liberation of the Saguia el Hamra and Rio de Oro (Polisario), an independence movement based in Tindouf, Algeria. Western Sahara's economy was dependent on pastoral nomadism, fishing, and phosphate mining. The country's open pit phosphate rock mine at Boucraa and associated beneficiation facilities in Laayoune were operated by the OCP subsidiary Phosphates de Boucraa S.A. (Phosboucraa). All trade and economic activities were controlled by the Moroccan Government. Western Sahara's population was estimated to be about 267,000 in 2004 (U.S. Central Intelligence Agency, 2005§).

Morocco had granted exploration contracts to several foreign companies to explore for oil offshore Western Sahara; among them were Kerr-McGee Corp. of the United States; Robertson Research International of Wales; Svitzer Ltd. (a subsidiary of the Dutch company Fugro); TGS Nopec of Norway; Total S.A. of France; and Wessex Exploration Ltd. of the United Kingdom in addition to Premier Oil plc and Sterling Energy plc, which had received conditional exploration rights from the Polisario. By the end of 2004, all these companies had ended their operations in Western Sahara with the exception of Kerr-McGee (afrol News, 2004a, b§; U.S. Energy Information Administration, 2005§).

Internet References Cited

afrol News, 2004a, Divestments from Kerr-McGee over Western Sahara engagement, accessed May 11, 2005, at URL http://www.afrol.com/articles/15084.
afrol News, 2004b, No oil off Sahara says withdrawing Total, accessed May 11, 2005, at URL http://www.afrol.com/articles/14879.
U.S. Central Intelligence Agency, 2005 (February 10), Western Sahara, World Factbook 2004, accessed March 31, 2005, at URL http://www.cia.gov/cia/publications/factbook/geos/wi.html.
U.S. Department of State, 2005, Morocco, Background Note, accessed October 19, 2005, at URL http://www.state.gov/r/pa/ei/bgn/5431.htm.
U.S. Energy Information Administration, 2005 (June), Arab Maghareb Union, Country Analysis Brief, accessed October 4, 2005, at URL http://www.eia.doe.gov/emeu/cabs/maghreb.html.

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TABLE 1
MOROCCO AND WESTERN SAHARA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004[e]
METALS						
Antimony, sodium antimonate		548	436	532	500	500
Cobalt:						
Concentrates, gross weight		11,378 r	15,725	16,896	16,178	17,000
Co content		967 r	1,242 r	1,453 r	1,391 r	1,600
Metal[3]		1,207 r	1,341 r	1,354 r	1,431 r,4	1,593 4
Copper:						
Concentrates, gross weight		23,150	19,120	17,799	17,539	14,200 p,4
Matte, gross weight		2,117	1,580	2,016	2,505	1,600
Cu content, concentrates and matte		7,080	5,400 r	5,000	4,900	4,400 p
Gold	kilograms	505	1,191	2,747 r	1,863	1,200 p
Iron and steel:						
Iron ore:						
Gross weight		6,462	7,976	8,736	6,300 r,4	9,900 p,4
Fe content[e]		3,500	4,300	4,700 r	3,400 r	5,300
Metal:[e]						
Pig iron		15,000	15,000	15,000	15,000 r	15,000
Steel, crude		5,000	5,000	5,000	5,000	5,000
Lead:						
Concentrate:						
Gross weight		117,353 r	110,906	88,582 r	54,779	44,700 p,4
Pb content		81,208	76,747	62,400 r	38,600 r	31,300
Cupreous matte, Pb content[e]		600	500	600	600	600
Metal:						
Smelter, primary only		66,812	58,178	71,840	62,000	62,000
Refined:						
Primary		66,812	58,178	71,840	61,473	35,000 4
Secondary[e]		3,000	3,000	3,000	3,000	4,000 4
Total[e]		70,000	61,000	75,000	64,000	39,000
Manganese ore, largely chemical-grade		25,830	13,757	18,064	--	9,000 p,4
Mercury[e]		10	10	10 r	10 r	10
Nickel content of nickle sulfate		84	151	109	126	130
Silver:						
Ag content of concentrates and matte	kilograms	43,200 e	42,400 e	57,000 e	25,400 r,e	26,000
Ag content of mine and smelter bullion	do.	246,204	238,043	220,000 e	175,155 r,4	170,000 e
Total	do.	289,000 e	280,000 e	276,789	200,529 r,4	195,952 4
Zinc concentrate:						
Gross weight		201,692	174,831	178,476	136,433	146,200 p,4
Zn content		103,064	89,339	90,487 r	69,200 r	74,600 4
INDUSTRIAL MINERALS						
Arsenic trioxide		4,426	6,026	5,469	6,872	6,900
Barite		343,557	471,102	469,934	358,500 r,4	355,800 p,4
Cement, hydraulic	thousand metric tons	8,100	10,000 e	10,200 e	10,400	11,000
Clays, crude:						
Bentonite		43,152	71,741	58,754	67,700 r,4	85,400 p,4
Fuller's earth (smectite)		30,665	40,664	43,243	14,944	15,000
Montmorillonite (ghassoul)		2,476	2,270	2,329	927	900
Feldspar		6,052	8,979	19,401	20,000	20,000
Fertilizers	thousand metric tons	2,441	2,719	2,602	2,542	2,405 4
Fluorspar, acid-grade		76,991	96,500	94,911	81,255	112,100 p,4
Gypsum[e]		475,000	550,000	600,000	600,000	600,000
Mica		1,897	--	--	--	--
Phosphate rock:						
Gross weight[5]	thousand metric tons	21,463	21,983	23,038 r	22,877	25,369 4
P_2O_5 content	do.	7,200	7,400	7,700	7,400	8,500
Phosphoric acid	do.	2,732	2,819	2,921	2,930	3,254 4

See footnotes at end of table.

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TABLE 1--Continued

MOROCCO AND WESTERN SAHARA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004[e]
INDUSTRIAL MINERALS--Continued						
Salt:[6]						
Rock		162,385 [r,4]	233,816 [r,4]	266,903 [r,4]	236,700 [r,4]	253,800 [4]
Marine[e]		40,000	40,000	27,622 [r,4]	36,000	36,000
Total		202,385 [r]	273,816 [r]	294,525 [r]	272,700 [r]	290,000
Strontium minerals, celestite		7,539	1,879	3,780	2,700	2,700 [e]
Sulphuric acid		NA	NA	8,600	8,900	9,500
Talc and pyrophyllite		12,522	27,246	39,612	1,959 [4]	2,000 [e]
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite		30,810	1,908	322	214 [4]	200 [e]
Gas, natural:						
Gross	million cubic meters	50	49 [e]	63 [r]	61 [r,4]	40 [p,4]
Dry[e]	do.	44	43	55 [r]	54 [r]	35
Petroleum:						
Crude[7]	thousand 42-gallon barrels	97	95 [e]	49 [r]	90 [4]	246 [p,4]
Refinery products:						
Liquefied petroleum gas	do.	2,800	2,710	2,690	1,000	3,000
Gasoline	do.	3,800	2,960	3,210	1,500	3,200
Jet fuel	do.	2,200	900	1,090	500	1,000
Kerosene	do.	800	880	620	300	900
Distillate fuel oil	do.	18,000 [e]	21,970	17,330	9,000	24,000
Residual fuel oil	do.	16,000 [e]	16,000	14,000	7,000	17,000
Other	do.	5,000 [e]	1,500	1,450	700	2,000
Total	do.	48,600 [e]	46,920	40,390	20,000	51,000

[e]Estimated, estimated data are rounded to no more than three significant digits; may not add to totals shown. NA Not available. [p]Preliminary. [r]Revised. -- Zero.

[1]Includes data available through November 28, 2005.

[2]In addition to the commodities listed, perlite and a variety of crude construction materials are produced, but information is inadequate to make estimates of output levels.

[3]Cobalt electrowon from cobalt concentrates and tailings from the Bou-Azzer Mine.

[4]Reported figure.

[5]Reported production from Morocco and Western Sahara.

[6]May include production from Western Sahara.

[7]Data for 2000 are based on crude oil and condensate production, which was reported as 13,106 metric tons.

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The Mineral Industry of Mozambique

By Thomas R. Yager

In 2004, the mineral industry of Mozambique produced aluminum, gold, and tantalum; such industrial minerals as bauxite, bentonite and other clays, beryl, diatomite, gemstones, graphite, and salt; and building materials that included cement, granite, gravel, limestone, marble, and sand. The country also produced coal and natural gas. Deposits of asbestos, copper, feldspar, fluorspar, gypsum, iron ore, manganese, mica, nepheline syenite, perlite, phosphate rock, rare earths, silica sand, and titanium have also been identified.

The International Monetary Fund (2005d, p. 208) estimated that Mozambique's real gross domestic product (GDP) grew by 7.8% in 2004 compared with 7.1% in 2003. In 2004, manufacturing accounted for 14% of the GDP; construction, 9.6%; electricity and water, 1.9%; and mining, 1.8%. The nominal GDP at purchasing power parity amounted to $23.7 billion in 2004 (International Monetary Fund, 2005c, p. 41; 2005§[1]).

Output in the mining sector increased by 216% in 2004 compared with 32% in 2003 and 52% in 2002. Most of the increase was attributable to the startup of the Temane natural gas project and increased production of tantalite. The production of gemstones, limestone, marble, and sand also increased; bauxite, beryl, coal, and gold production fell. In 2004, the manufacturing sector grew by nearly 13% as a result of higher aluminum production at the Mozal 2 project. With the completion of this project and the Mozambique Natural Gas Project, however, output in the construction sector fell by nearly 15%. In the electricity and water utility sectors, output increased by nearly 6% (International Monetary Fund, 2005a, p. 11, 19-22).

Commodity Review

Metals

Aluminum.—Mozambique was Africa's second leading producer of aluminum behind South Africa. The Mozal aluminum smelter, which used alumina imported from Western Australia as raw material, increased output to 549,000 metric tons (t) in 2004 compared with 407,000 t in 2003 and 273,000 t in 2002 (table 1). Production increased because of the completion of the Mozal 2 project in April 2003, which doubled Mozal's rated capacity to 506,000 metric tons per year (t/yr). Aluminum production was expected to increase by less than 1% in 2005 (International Monetary Fund, 2005b, p. 30).

Exports of aluminum rose to $915 million in 2004 compared with nearly $568 million in 2003. In 2004, aluminum accounted for 61% of Mozambique's total exports. From 2000 to 2004, aluminum accounted for 75% of the total growth in the country's exports (International Monetary Fund, 2005c, p. 69).

E.C. Meikles (Pty.) Ltd. of Zimbabwe operated a small bauxite mine in Manica Province. In 2004, output was 6,723 t compared with 11,793 t in 2003 and 8,130 t in 2000. All of Mozambique's bauxite production was exported in 2004. Bauxite production was expected to rise by 17% in 2005 (International Monetary Fund, 2005b, p. 28; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

Gold.—Mozambique's gold resources were located in lode and placer deposits throughout the country; gold was produced by artisanal miners. Officially reported production of gold was 56 kilograms (kg) in 2004 compared with 63 kg in 2003 and 23 kg in 2000. Gold production was expected to rise by 16% in 2005 because of Government support for artisanal miners and the rehabilitation of access routes to gold mining areas in Niassa (International Monetary Fund, 2005b, p. 28-29; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

In July, Central African Mining and Exploration Company plc (CAMEC) was awarded 5-year prospecting and exploration licenses for gold in the Nhamatando District in Sofala Province. The company explored for gold at the Muda River project in the Nhamatando District in Zambezia Province. From December 2003 to April 2004, about 2,000 artisanal miners operated in the southern portion of the Muda River license area. The miners produced more than 20 kilograms per month of gold. CAMEC also explored for gold in the Gile District in Zambezia Province (Central African Mining and Exploration Company plc, 2004b).

Nickel.—African Eagle Resources held a prospecting license for the Muazua nickel project in northern Mozambique. The company carried out sampling and mapping at Muazua in late 2004.

Columbium (Niobium) and Tantalum.—National production of tantalite increased to 712,095 kg in 2004 from 188,695 kg in 2003 and 46,900 kg in 2002; the value of tantalite production amounted to $15.7 million in 2004. Rising production may have been partially attributable to the Marropino Mine, which reopened in April 2003. Fleming Family & Partners owned a majority stake in the mine; the company planned to produce about 110,000 kilograms per year (kg/yr) of tantalum oxide (Ta_2O_5) (Metal Bulletin, 2003; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

In 2004, CAMEC started tantalite production. By September, the company was producing at a rate of about 17,000 kg/yr of Ta_2O_5. CAMEC planned to spend $500,000 to upgrade its production facilities; output was expected to reach 27,000 kg/yr of Ta_2O_5 by May 2005 and 54,000 kg kg/yr of Ta_2O_5 by December 2005. In July, the company was granted prospecting and exploration licenses for tantalum and associated minerals in the Alto Molocue, Lugela, and Mocuba Districts in Zambezia Province and for tantalum and tin in the Nhamatando District

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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in Sofala Province (Central African Mining and Exploration Company plc, 2004a, c).

In September, TAN Mining and Exploration of South Africa decided to proceed with the reopening of the Muiane Mine. The company planned to restart mining in mid-2005 at a cost of $5 million. TAN planned to produce 82,000 kg/yr of Ta_2O_5 in concentrate from 420,000 t/yr of ore; the tantalite recovery rate would be about 60%. The expected life of the mine was 5 years (Mining Review Africa, 2005).

Titanium and Zirconium.—The Corridor Sands Project was based upon 10 deposits of heavy-mineral sands near Chibuto in southern Mozambique. Starting in 2007, WMC Resources Ltd. of Australia planned to produce 375,000 t/yr of titanium slag, 184,300 t/yr of high-purity pig iron, 21,500 t/yr of zircon, 5,100 t/yr of rutile, and 2,700 t/yr of leucoxene in the initial phase of the project. Production could eventually rise to 1 million metric tons per year (Mt/yr) of titanium slag, 491,100 t/yr of high-purity pig iron, 62,500 t/yr of zircon, 12,200 t/yr of rutile, and 6,400 t/yr of leucoxene. The initial phase of the project was expected to cost $500 million. In 2004, WMC spent $8.6 million on Corridor Sands; uncertainty over the price of electricity for the project delayed the startup date for the project until at least 2008. The company was considering the use of natural gas from the Pande and Temane gasfields as a power source (African Energy, 2004; WMC Resources Ltd., 2003; 2005, p. 29).

Kenmare Resources plc of Ireland started construction of the Moma mineral sands mine in August. The company planned to start production in the second half of 2006 and to produce 615,000 t/yr of ilmenite, 60,000 t/yr of zircon, and 17,000 t/yr of rutile. Moma's projected lifetime was 20 years. Capital costs were expected to be $348 million; annual revenues, $85 million, and annual operating costs, $23 million. Kenmare signed contracts for the purchase of 50% of the ilmenite production in the first 5 years of operation (Industrial Minerals, 2004; Mining Journal, 2004; Kenmare Resources plc, 2005, p. 4).

Industrial Minerals

Clay and Shale.—Mozambique had deposits of bentonite, brick clay, and kaolin. Brick clay production rose to 108,231 t in 2004 compared with 100,176 t in 2003. Cia. Desenvolvimento Mineira resumed mining bentonite at Boane in southern Mozambique; production had been shut down by flooding. In 2004, the company produced 3,336 t of crude bentonite and 578 t of processed bentonite (Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

Cement.—Cimentos de Portugal, SGPS, SA (Cimpor) held a 65.4% stake in Cimentos de Moçambique SARL, which was the country's only cement producer. The company operated plants at Dondo, Matola, and Nacala. In 2004, Cimpor experienced operational problems at the Matola plant; sales fell by nearly 5% (Cimentos de Portugal, SGPS, SA, 2005).

Diatomite.—Production started at a diatomite mine in Manica Province in 2004. Production amounted to between 200 and 300 metric tons per month (t/mo) in 2004, and was expected to increase to 500 t/mo in mid-2005 (National Directorate of Mines, oral commun., February 9, 2005). Resources of diatomite were estimated to be nearly 4 Mt in Manica Province and 2 Mt in the Boane District.

Gemstones.—The mine output of garnet rose to 2,686 kg in 2004 from 440 kg in 2003 and 1,136 kg in 2002 after recovering from rains that shut down production at the Cuamba Mine in 2003. Sociedade Mineira de Cuamba E.E., which held the rights to the Cuamba Mine, was in the process of being privatized. The production of aquamarine, dumortierite and tourmaline also increased sharply (table 1). Garnet production was expected to increase by 77% in 2005; dumortiertie, 11%; aquamarine, 4%; and tourmaline, 1% (International Monetary Fund, 2005b, p. 28; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

Stone, Crushed.—The production of limestone increased by 18% in 2004 compared with 4% in 2003 and 78% in 2002. Sand production rose by 4% in 2004 compared with 72% in 2003 and 71% in 2002. These increases may have been the result of rapid growth in the construction industry in 2002, which was partially attributable to the expansion of the Mozal smelter. In 2005, the production of limestone was expected to increase by more than 5%, and sand, by 14% (International Monetary Fund, 2005b, p. 28).

Stone, Dimension.—One of Mozambique's few large-scale marble quarries was located at Montepuez in Cabo Delgado Province. Marble from Montepuez was processed into finished products at a plant in Pemba, some of which were exported to Portugal. In 2004, the production of marble blocks increased by nearly 37%, and marble slabs, by nearly 34%. Granite production fell by 3%. Marble production has been limited in recent years by competition from South Africa. Granite production has fallen because of difficulty in finding markets. In 2005, the production of marble blocks and slabs was expected to rise by 10% and 12%, respectively, because of the expansion of the national electricity grid and the installation of new equipment in the quarries. Granite production was expected to rise by nearly 5% (International Monetary Fund, 2005b, p. 28-29; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

Mineral Fuels

Coal.—The production of coal has been limited in recent years because damage to the Sena rail line during the civil war in the 1980s cut off access from the Moatize coalfield to overseas markets. Output was 16,525 t in 2004 compared with 36,742 t in 2003 and 16,115 t in 2000. Production shut down in the first quarter of 2004 because of the installation of a new transportation system at the Chipanga XI Mine. Exports of coal rose to 30,288 t in 2004 compared with 15,138 t in 2003; coal was exported to Malawi. In 2005, coal production was expected to rise by 59% because of the completion of repairs at the Chipanga XI Mine and rising world demand for coal (International Monetary Fund, 2005a, p. 19; 2005b, p. 28; Estevao T. Rafael Pale, National Director, National Directorate of Mines, written commun., May 12, 2005).

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In November, Companhia Vale do Rio Doce (CVRD) of Brazil won the bid to develop the Moatize coalfield. The company planned to conduct a feasibility study from January 2005 to January 2007. If the feasibility study yielded favorable results, CVRD planned to build a mine that would produce 14 to 15 Mt/yr of coal. Production was expected to start in 2009. CVRD also planned to build a coal-fired power station with a capacity of 1,500 megawatts (MW). The company agreed to market 15% of Moatize's production in Mozambique; most of the remainder would be consumed by steel plants in Brazil. Development of the Moatize Mine would also require rehabilitation of the railway from Beira to Tete, and the construction of a maritime export terminal at Beira. Total costs of the project were expected to be $1 billion (Companhia Vale do Rio Doce, 2004; Mozambique News Agency, 2004a).

Natural Gas.—In 2004, Mozambique's production of natural gas rose to nearly 1.3 billion cubic meters from 1 million cubic meters in 2003 with the opening of the Temane Gas Project. Exports of natural gas to South Africa amounted to $31.3 million in 2004, or about 2% of total exports. Sasol Ltd. of South Africa, which operated the project, used gas from Temane to supply its chemical plants. The Mozal smelter and other Mozambican industrial establishments were expected to purchase gas from Temane and Pande in the future. Natural gas production was expected to rise by 91% in 2005. Sasol indicated that additional production increases to more than 3.1 billion cubic meters could be achieved without further investment (Sasol Ltd., 2003; International Monetary Fund, 2005b, p. 28; 2005c, p. 69).

In July, Det Norske Olje-Selskap (DNO) of Norway abandoned its exploration activities at Savane in Sofala Province. The company planned to conduct further exploration at Chinapamimba, which was also located in Sofala (Mozambique News Agency, 2004b).

Petroleum.—Mozambique produced neither crude petroleum nor refined petroleum products and relied on imports. DNO explored for petroleum in the Inhaminga onshore block north of Beira (Petroleum Economist, 2004). Petronas of Malaysia explored for petroleum in an offshore block near the Zambezi Delta.

Infrastructure

The Governments of Mozambique and Portugal were the main shareholders in Hidroelectrica Cahora Basa (HCB). The Cahora Bassa hydroelectric plant had a capacity of 2,075 MW. In 2004, the plant was undergoing rehabilitation that was expected to be complete in 2005. In February, the Government of Portugal announced plans to sell its share to the Government of Mozambique (Africa Energy Intelligence, 2004b; African Energy, 2004).

The production of electricity increased by 6% in 2004. Production for the domestic market increased by 12%; demand increased because of economic growth and rural electrification. Production for export to Botswana, Zimbabwe, and other countries fell in 2004. Sales to Zimbabwe, which absorbed 450 MW of capacity, were reduced because of Zimbabwe Electricity Supply Authority's inability to pay its debts. Exports of electricity amounted to $102 million in 2004, or 7% of total exports. The production of electricity was expected to rise by nearly 15% in 2005; the electricity grid was likely to be expanded to 20 district capitals and solar power systems were to be installed in 10 localities (African Energy, 2004; International Monetary Fund, 2005a, p. 21-22; 2005b, p. 30-31; 2005c, p. 69).

The state-owned company Electricidade de Mocambique (EDM) received numerous loans for rural electrification in 2004. The World Bank Group loaned $67 million to EDM; Exim Bank of India, $18 million; and the Swedish International Development Agency, $18 million. KFW of Germany loaned $11 million to EDM for electrification in Sofala Province, and the Nordic Development Fund, $8 million for electrification in Zambezi Province. The Africa Development Fund, the African Development Bank, and the Danish International Development Agency of Denmark offered loans to connect suburbs to urban grids (Africa Energy Intelligence, 2004a).

By April, Mozambique's state-owned rail company had rebuilt 40 kilometers (km) of the 650-km railway from Beira to Tete, which linked the Moatize Mine to the Port of Beira. The railway has been inoperable since 1984 because of civil war and a lack of funds for rehabilitation. In September, the World Bank Group agreed to provide financing for the rehabilitation of the railway; Ircon International of India and Rites Ltd. of India won the contract to rebuild the line (Africa Mining Intelligence, 2004; Mozambique News Agency, 2004c).

Outlook

The International Monetary Fund (2005d, p. 208) predicted that Mozambique's GDP will increase by 7.3% in 2005 and 6.5% in 2006. Rising natural gas and tantalite production were expected to contribute to economic growth in 2005. The Moma Mine was expected to increase economic growth in 2006 and 2007; the outlook for titanium minerals in Mozambique depended heavily upon global market trends and reliable domestic power supplies. The development of the Moatize Mine depended upon global market trends and the rehabilitation of infrastructure. Demand for construction materials could increase with the development of the Corridor Sands, Moatize, and Moma projects.

References Cited

Africa Energy Intelligence, 2004a, Mozambique—Flurry of loans for rural electrification: Africa Energy Intelligence, no. 379, October 20-November 2, p. 6.

Africa Energy Intelligence, 2004b, Mozambique—Lisbon to sell HCB: Africa Energy Intelligence, no. 363, February 11-24, p. 7.

Africa Mining Intelligence, 2004, Mozambique—Movement on Sena Railway: Africa Mining Intelligence, no. 92, September 15-28, p. 3.

African Energy, 2004, Cahora Bassa deal may hold the key to regional competition—Or further block projects: African Energy, no. 77, August, p. 9-10.

Central African Mining and Exploration Company plc, 2004a, CAMEC widens exploration activities in Mozambique: London, United Kingdom, Central African Mining and Exploration Company plc press release, July 19, 2 p.

Central African Mining and Exploration Company plc, 2004b, CAMEC widens gold exploration activities in Mozambique: London, United Kingdom, Central African Mining and Exploration Company plc press release, December 8, 2 p.

Digitized by Google

Central African Mining and Exploration Company plc, 2004c, Interim results for the six months ended 30 September 2004: London, United Kingdom, Central African Mining and Exploration Company plc press release, December 29, 13 p.
Cimentos de Portugal, SGPS, SA, 2005, Announcement of consolidated profits for 2004: Lisbon, Portugal, Cimentos de Portugal, SGPS, SA, 5 p.
Companhia Vale do Rio Doce, 2004, CVRD wins concession to explore coal in Mozambique: Rio De Janeiro, Brazil, Companhia Vale do Rio Doce, November 12, 1 p.
Industrial Minerals, 2004, Moma minisands almost there: Industrial Minerals, August, no. 443, p. 62-65.
International Monetary Fund, 2005a, Republic of Mozambique—Poverty reduction strategy paper progress report (review of the economic and social plan for 2004): Washington, DC, International Monetary Fund, Country Report No. 05/310, September 6, 109 p.
International Monetary Fund, 2005b, Republic of Mozambique—Poverty reduction strategy paper—Economic and social plan for 2005: Washington, DC, International Monetary Fund, Country Report No. 05/312, September 6, 105 p.
International Monetary Fund, 2005c, Republic of Mozambique—Selected issues and statistical appendix: Washington, DC, International Monetary Fund, September 6, 72 p.
International Monetary Fund, 2005d, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.
Kenmare Resources plc, 2005, Annual report and accounts 2004: Dublin, Ireland, Kenmare Resources plc, 44 p.
Metal Bulletin, 2003, Fleming's Mozambique tantalum project ramps up: Metal Bulletin, no. 8752, February 27, p. 6.
Mining Journal, 2004, Kenmare arranges Moma financing: Mining Journal, June 25, p. 13.
Mining Review Africa, 2005, TAN and the Muiane project: Mining Review Africa, no. 1, p. 28.
Mozambique News Agency, 2004a, Brazilian mining giant wins Moatize tender: Mozambique News Agency press release, November 25, 2 p.
Mozambique News Agency, 2004b, Not enough gas in Savane: Mozambique News Agency press release, July 27, 1 p.
Mozambique News Agency, 2004c, Sena line work underway: Mozambique News Agency press release, April 2, 1 p.
Petroleum Economist, 2004, News in brief—Mozambique: Petroleum Economist, v. 71, no. 8, August, p. 43.
Sasol Ltd., 2003, Mega gas project fast approaching completion: Investor Insight, no. 1, December, p. 4.
WMC Resources Ltd., 2003, Corridor Sands: Southbank, Australia, WMC Resources Ltd., brochure, January, 9 p.
WMC Resources Ltd., 2005, Annual report 2004: Southbank, Australia, WMC Resources Ltd., 80 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Mozambique, World Economic Outlook Database, accessed July 18, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

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TABLE 1

MOZAMBIQUE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
Aluminum:						
Bauxite		8,130	8,592	9,119	11,793	6,723
Metal, refined		53,800	266,000	273,000	407,000	549,000
Beryl	kilograms	18,600	800	54,300	78,300	45,200
Cement, hydraulic	thousand metric tons	270	265	285	362	350 e
Clays:						
Bentonite:						
Crude		16,144	1,357	--	--	3,336
Processed		274	254	580	684	578
Brick		61,884	63,125	84,024	100,176	108,231
Coal, bituminous		16,115	27,600	43,512	36,742	16,525
Columbium (niobium) and tantalum, columbite-tantalite concentrate:						
Gross weight	kilograms	25,000	27,000	46,900	188,695	712,095
Nb content[e]	do.	3,100	3,300	5,500	23,000	87,000
Ta content[e]	do.	7,200	7,700	13,000	54,000	205,000
Diatomite		--	--	--	--	3,000 e
Gemstones:						
Aquamarine	kilograms	154	47	26	8 r	18
Dumortierite		60	50	40	65	113
Garnet	kilograms	547	--	1,136	440	2,686
Tourmaline	do.	77	18	124	581	1,570
Gold[2]	do.	23	22	17	63	56
Natural gas	million cubic meters	1 r	1 r	2 r	1 r	1,295
Quartz	kilograms	NA	24,765	31,363	30,985 r	173,478
Salt, marine[e]		7,000	10,000	80,000	80,000	80,000
Sands	cubic meters	299,540	464,684	795,813	1,372,032	1,429,743
Stone:						
Granite	do.	796	662	670	539	521
Gravel and crushed rock	do.	602,141	503,716	795,733	800,000 r, e	800,000 e
Limestone		585,590	729,230	1,301,232	1,348,372	1,593,450
Marble:						
Block	cubic meters	454	320	453	452	617
Slab	square meters	14,640	15,303	9,980	10,227	13,666

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. NA Not available. -- Zero.

[1]Table includes data available through August 25, 2005.

[2]Does not include unreported production; total output of gold was estimated to be roughly 360 to 480 kilograms per year.

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TABLE 2
MOZAMBIQUE: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Aluminum		Mozal SARL (BHP Billiton plc, 47.11%)	Maputo	506,000.
Bauxite		E.C. Meikles (Pty) Ltd. of Zimbabwe	Monte Snuta	12,000.[e]
Bentonite		Cia. Desenvolvimento Mineira	Boane	17,000.[e]
Cement		Cimentos de Mocambique, SARL (Cimentos de Portugal, SGPS, SA, 51%)	Dondo, Matola, and Nacala	760,000.
Coal, bituminous		Carbomoc	Chipanga XI Mine at Moatize	60,000.
Garnet	kilograms	Sociedade Mineira de Cuamba E.E.	Cuamba	4,400.[e]
Graphite		Kenmare Resources plc[1]	Ancuabe	10,000.
Marble, block	cubic meters	Marmonte E.E.	Montepuez	1,500.
Natural gas	million cubic meters	Sasol Ltd. (50%)	Temane	3,100.
Columbium (niobium) and tantalum, tantalite concentrate	kilograms	Fleming Family & Partners	Marropino	315,000;[e] 110,000 Ta_2O_5.
Do.	do.	Central African Mining and Exploration Company plc	Zambezia Province	48,000; 17,000 Ta_2O_5.
Do.	do.	Hegemony Resources	Naquissupa	NA.

NA Not available.
[1]On care and maintenance since 1999.

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TABLE 3

MOZAMBIQUE: MINERAL RESOURCES IN 2004[1]

Commodity	Deposit	Tonnage	Grade	Mineral content
Bentonite	Boane	7.1 Mt	NA	NA.
Beryllium	Monea, Morrua, and Muiane	NA	NA	3,100 t BeO.
Coal	Minjova	7,100 Mt	NA	NA.
Do.	Mucanha-Vuzi	3,600 Mt	NA	NA.
Do.	Moatize	2,400 Mt	NA	NA.
Do.	Maniamba	230 Mt	NA	NA.
Columbium (niobium) and tantalum	Marropino	22 Mt	108 g/t Nb_2O_5; 254 g/t Ta_2O_5	2,400 t Nb_2O_5; 5,600 t Ta_2O_5.
Do.	Morrua	7.5 Mt	88 g/t Nb_2O_5; 661 g/t Ta_2O_5	660 t Nb_2O_5; 5,000 t Ta_2O_5.
Do.	Muiane	2 Mt	320 g/t Ta_2O_5	640 t Ta_2O_5.
Gold:				
Placer	Chimezi, Inhamurra, Muza, and Revue Rivers	110 million cubic meters	0.25 grams per cubic meter	28 t Au.
Lode	Chimezi, Chua, Mangota, and Penhalonga/Revue	3.5 Mt	6.7 g/t Au	23 t Au.
Graphite	Cabo Delgado Province	33 Mt	15% graphite	5 Mt graphite.
Do.	Satemua	5.6 Mt	6.3% graphite	350,000 t graphite.
Natural gas	Pande and Temane	130 billion cubic meters	NA	NA.
Titanium and zirconium	Corridor Sands:			
Do.	West Block	1,800 Mt	4.14% ilmenite; 0.02% rutile; 0.15% zircon	73 Mt ilmenite; 350,000 t rutile; 2.6 Mt zircon.
Do.	East Block	910 Mt	3.8% ilmenite	34.5 Mt ilmenite.
Do.	Other areas	14,000 Mt	NA	NA.
Do.	Moma	2,370 Mt	3% ilmenite; 0.08% rutile; 0.25% zircon	72 Mt ilmenite; 2 Mt rutile; 6 Mt zircon.

NA Not available.

[1]Abbreviations used for commodities in this table include the following: Au, gold; BeO, beryllium oxide; Nb_2O_5, columbium (niobium) oxide; and Ta_2O_5, tantalum oxide. Abbreviations used for units of measure in this table include the following: g/t--grams per metric ton; Mt--million metric tons; and t--metric tons.

Sources: Afonso, R.S., and Marques, J.M., 1998, Recursos minerais da Republica de Mocambique [Mineral resources of the Republic of Mozambique]: Maputo, Mozambique, Direccao Nacionalde Geologica, 150 p.; Companhia Vale do Rio Doce, 2004, CVRD wins concession to explore coal in Mozambique: Rio De Janeiro, Brazil, Companhia Vale do Rio Doce, November 12, 1 p.; Kenmare Resources plc, 2005, Annual reportand accounts 2004: Dublin, Ireland, Kenmare Resources plc, 44 p.; Mining Review Africa, 2005, TAN and the Muiane project: Mining Review Africa, no. 1, p. 28; Radler, Marilyn, 2003, Worldwide reserves grow; oil production climbs in 2003: Oil & Gas Journal, v. 101, no. 49, December 22, p. 43-47; Ruffini, Antonio, 1998a, Mozambican focus on heavy minerals, coal: African Mining, v. 3, no. 1, January-February, p. 45-46, 52; Ruffini, Antonio, 1998b, Rehabilitating Mozambique's coal sector: African Mining, v. 3, no. 1, January-February, p. 47-48; WMC Resources Ltd., 2003, Corridor Sands: Southbank, Australia, WMC Resources Ltd. brochure, January, 9 p.

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The Mineral Industry of Namibia

By Philip M. Mobbs

Diamond remained the most economically significant mineral commodity produced by the mining industry of Namibia; zinc and uranium ranked second and third. Namibia, which is located on the southwestern coast of Africa between South Africa and Angola, was the world's sixth leading producer of uranium and seventh ranked gem diamond producer. Other mineral production included copper, fluorite, gold, lead, salt, silver, and stone (Olson, 2005; World Nuclear Association, 2005§[1]).

In 2004, the 825,418-square-kilometer (km^2) country had an estimated population of 2 million. Based on purchasing power parity estimates published by the International Monetary Fund (2005§), the gross domestic product (GDP) was $13.35 billion in 2004, and the GDP per capita was about $6,440.[2] The real GDP growth rate was 4.2%, and inflation dropped to 4.1% in 2004 from 7.2% in 2003 (World Bank Group, 2005§).

Government Policies and Legislation

The Government's 2003 minerals policy was designed to ensure the sustainable contribution of minerals to the socioeconomic development of Namibia. The Ministry of Mines and Energy was responsible for making and enforcing policies related to minerals and energy. To develop the mining sector, the Ministry of Trade and Industry (2003§) actively promoted foreign investment opportunities.

The basic mining law was the Minerals (Prospecting and Mining) Act of 1992. The Ministry also published mine health and safety regulations. The Diamond Act of 1999 regulated and controlled the holding, transport, and processing of diamond. Petroleum exploration and development were regulated by the Petroleum (Exploration and Production) Act of 1991, the Petroleum (Taxation) Act of 1991, the Petroleum Laws Amendment Act of 1998, and associated regulations.

In April, much of the Sperrgebiet in southwestern Namibia was proclaimed to be a National Park by the Cabinet. Because the new park, which covered an area of about 26,000 km^2, had been a restricted diamond mining area since the late 1920s, there had been little development of the area (Namdeb Diamond Corp. (Pty) Ltd., 2005, p. 31).

Production

During 2004, mineral production results were mixed (table 1). Notable developments included an increase in mine and quarry production of marble (about 85% compared with 2003 production), uranium (49%), diamond (35%), fluorspar (32%), and zinc (14%), and a decrease in lead (13%), dolomite (12%), and gold (12%). Arsenic trioxide recovery increased by about 225% in 2004 compared with 2003.

De Beers Marine Namibia (Pty.) Ltd.'s offshore operations and the initiation of production from Namdeb Diamond Corp. (Pty.) Ltd.'s Pocket Beaches (Site 2), which is located about 120 kilometers (km) north of Oranjemund, accounted for a significant proportion of the increase in diamond production in 2004. Because of the strength of the Namibian dollar relative to the U.S. dollar and uranium sales were denominated in U.S. dollars, Rössing Uranium Ltd. attempted to counter the adverse effect on domestic income after conversion of U.S. dollar income into Namibian dollars by ramping up uranium production in 2004. Namzinc (Pty.) Ltd.'s Skorpion zinc refinery completed its first full year of production in 2004. Zinc metal production increased by 154% in 2004 compared with 2003 when the refinery initiated production.

Trade

According to the Bank of Namibia (2005, p. 24-25), the merchandise trade deficit declined by about 49% to $278 million in 2004 from about $540 million in 2003. Total merchandise exports in 2004 were valued at about $1.83 billion, of which diamond accounted for $824 million (45% of total exports); manufactured products, which included processed zinc, $431 million (24% of total exports); and other mineral commodities, such as copper, gold, uranium, and unprocessed zinc, about $228 million (12% of total exports).

Higher international metals prices influenced the appreciation of the Namibian dollar, which was pegged to the South African rand. In 2004, the Namibian dollar appreciated by 14.6% against the U.S. dollar, which followed a 19.8% appreciation in 2003. Similar to the minerals economy of South Africa, the exchange rate differential led to the reduction of local currency obtained from U.S.-dollar-denominated mineral commodity export sales and had a negative impact on mining operations in Namibia that exported U.S.-dollar-denominated minerals.

Commodity Review

Metals

Copper.—Ongopolo Mining and Processing Ltd. operated the Tsumeb copper smelter and the Kombat and the Otjihase copper-lead-silver mines in 2004. Ongopolo proposed to open a copper refinery at Tsumeb and to reopen the Matchless Mine, which had closed in 1983.

The Haib copper prospect had been extensively evaluated before being put on hold in 1998 because of unfavorable market conditions. Subsequent ownership disputes were effectively resolved in 2004 when the Government issued exclusive

[1]References that include a section mark (§) are found in the Internet References Cited section.

[2]Where necessary, values have been converted from Namibian dollars (N$) to U.S. dollars (US$) at the rate of N$6.45=US$1.00 for 2004 and N$7.57=US$1.00 for 2003.

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prospecting license (EPL) No. 3140, which included the Haib deposit, to Deep South Mining (Pty) Ltd. of Namibia. Afri-Can Marine Minerals Corp. of Canada subsequently began negotiations to obtain a 70% interest in the EPL.

Gold.—AngloGold (Pty) Ltd. of Namibia (a subsidiary of AngloGold Ashanti Limited of South Africa) held a 100% interest in the Navachab open pit gold mine near Karibib. The Navachab Mine had the capacity to treat 1.32 million metric tons per year (Mt/yr) of ore. The mine accounted for more than 90% of national gold output. In 2004, the mine's production was about 2,080 kilograms (kg) compared with 2,298 kg in 2003 and about 2,650 kg in 2002. The decrease was attributed to lower ore throughput and lower recovery grades. The mill processed stockpiled ore for the first half of 2004 as the mine transitioned to owner mining from contract mining. Production was expected to increase in 2005 (AngloGold Ashanti Limited, 2005, p. 43-44).

Bafex Exploration (Pty) Ltd. of Namibia held eight exclusive prospecting licenses in northwestern Namibia. In 2004, Bafex was acquired by Helio Capital Corp. of Canada, which was renamed Helio Resources Corp. Bafex initiated exploration on the Leicester and the Zebra licenses. Boulder Mining Corp. of Canada, which was earning 100% interest in the copper-gold Teverede prospect from Bafex, continued exploration at Teverede.

Lead and Zinc.—Subsidiary companies of Anglo American plc completed their first full year of production from the Skorpion Mine and solvent extraction-electrowinning (SX-EX) zinc refinery. Skorpion Mining Co. produced 1.3 million metric tons (Mt) of ore from the mine. In 2004, the 150,000-metric-ton-per-year-capacity SX-EX plant of Namzinc processed 1.2 Mt of ore and produced 119,200 metric tons (t) of zinc. The Skorpion deposit, which is located approximately 85 km northeast of Oranjemund and 25 km north of Rosh Pinah, had been discovered in 1976, but interest in the project flagged by 1982 because of the technical difficulties associated with the processing the oxide ore. Reunion Mining Plc acquired an interest in the deposit in 1996 and subsequently developed a viable processing procedure. In 1998, Reunion completed a bankable feasibility study, and in 1999, Anglo American acquired Reunion. Mine construction began in 2000, and initial production from Skorpion, in 2003. The expected mine life is 15 years (Anglo American plc, 2005, p. 117; Tassell, 2005).

Rosh Pinah Zinc Corp. (Pty) Ltd. (a joint venture of Kumba Resources Ltd. of South Africa, 89.5% interest, and PE Minerals Namibia (Pty) Ltd., 10.5%) operated the Rosh Pinah underground zinc mine. In 2004, Rosh Pinah increased production of zinc concentrates by 15% to about 124,000 t. Production of lead concentrates decreased by about 13% to about 27,000 t. Zinc concentrates were shipped through Walvis Bay to Kumba's Zincor refinery in South Africa for treatment (Kumba Resources Ltd., 2005, foldout after p. 1).

Tantalum and Titanium.—Reefton Mining NL of Australia explored the tantalum resources at the Sandamap pegmatite on its Erongo license in central Namibia and the sampled heavy minerals associated with the diamondiferous gravels in the Mowe Bay sector of its Skeleton Coast Diamond Project in northern Namibia.

Uranium.—In 2004, Rössing, which was owned by Rio Tinto plc of the United Kingdom with a majority interest of 68.6%, produced 3,582 t of uranium oxide (U_3O_8) from about 11 Mt of ore and removed an additional 8.1 Mt of waste rock from the open pit. Despite higher demand, which resulted in a 49% increase in production from 2,401 t of U_3O_8 in 2003 and higher international uranium spot-market prices, Rössing posted a financial loss in 2004 primarily because of exchange rate losses. Most of the uranium oxide, which was exported under long-term contracts to Europe, North America, and Southeast Asia for use in generating electricity in nuclear powerplants, was sold for U.S. dollars, which were converted to Namibian dollars for payment of local expenses. To offset the negative impact of a weak U.S. dollar, Rössing planned to increase output to about 3,800 t in 2005. The increased production would allow the company to cover its long-term contracts and to sell surplus production on the spot market, which had risen to about $10 per kilogram in 2004 compared with about $3 per kilogram in 2000 (Rössing Uranium Ltd., 2005a§, b§).

With fast depleting reserves, the mine's projected remaining 3-year life provided impetus for a feasibility study on the development of the Phase 2 area, which is located west of the existing (2004) open pit. Projected excessive waste volumes in the Phase 2 area resulted in Rössing directing its focus to the development of an area southeast of the existing mine, which could extend the mine's life another 2 years.

In 2004, Paladin Resources Ltd. of Australia began a bankable feasibility study on the development of the Langer Heinrich open pit uranium mine. The Langer Henrich deposit, which is located about 80 km northeast of Walvis Bay, had been discovered in 1973 and evaluated for several years by the General Mining and Finance Corp. (Gencor) of South Africa before being set aside because of low uranium prices (Paladin Resources Ltd., 2004, 2005).

Industrial Minerals

Diamond.—Namdeb, which was established in 1994 as a joint venture between De Beers Centenary AG (50%) and the Namibian Government (50%), was the country's leading diamond producer. During 2004, Namdeb, its contractors, and its subsidiaries produced 1.9 million carats, of which 840,000 carats was from the offshore mining operations of De Beers Marine Namibia, which was a Namdeb associated company. In April 2004, Namdeb began production from Pocket Beaches (Site 2). Namdeb commissioned the $50 million expansion of its Elizabeth Bay operations in July, and officially inaugurated the new contractor treatment facility (CTF) in Lüderitz in August. The CTF plant would process diamondiferous gravel concentrate produced by Namdeb's beach and marine contractors. Namdeb expected that the contractor output would increase to 30,000 carats by 2006 from about 20,000 carats in 2003 (Namdeb Diamond Corp. (Pty) Ltd., 2005, p 18, 22-24, 34; Katsawara, 2004§).

In 2004, the Government and Sakawe Mining Corp. (Samicor) (a subsidiary of LL Mining Corp. BV, which was a member of the Leviev Group of Israel) concluded a mining agreement that covered the mineral rights formerly held by the bankrupt

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Namibian Minerals Corp., and Samicor began offshore production operations. The Leviev Group also established LLD Diamonds Namibia, which was a cutting and polishing factory in Windhoek. Samicor was to provide all the diamond that it produced offshore Namibia to LLD Diamonds for processing. Other diamond-cutting facilities in Namibia processed imported stones.

Diamond Fields (Pty) Ltd. of Namibia (a subsidiary of Diamond Fields International Ltd. of Canada) formed a 6-month joint-venture operation on Mining Lease 111, which is located offshore Lüderitz and included the Marshall Fork and the Diaz 12 marine deposits, with Samicor Mining Services (Pty) Ltd. (a subsidiary of Samicor). The joint venture produced 52,826 carats before production was suspended in October when Diamond Fields purchased and began to rehabilitate the MV Diamond Fields Discover. Diamond Fields expected to operate the MV Diamond Fields Discover and to resume offshore diamond production in 2005 (Diamond Fields International Ltd., 2004).

In addition to diamond production, companies were actively exploring for diamond in Namibia in 2004. Afri-Can Marine Minerals Corp. of Canada continued exploration work on the Woduna area of offshore block J, which is located north of Hottentot Bay. In January 2004, Afri-Can also agreed to acquire a 75% interest in the Gibeon kimberlite field in south-central Namibia (Afri-Can Marine Minerals Corp., 2004§).

Motapa Diamonds Inc. continued exploration of the onshore Kaudon and Kavango diamond licenses in northeastern Namibia. Mount Burgess Mining N.L. of Australia continued drilling on its Tsumkwe diamond prospect. Sonnberg Diamonds (Pty) Ltd. (a subsidiary of Namibian Resources PLC of the United Kingdom) contract mined the Pomona license for Namdeb. In 2004, Sonnberg acquired, completed an environmental impact assessment, and stockpiled 35,000 t of diamondiferous gravel on the adjacent Saltztal license. Namibian Resources expected that a new dense-media separation unit would begin production on the Saltztal license in January 2005 (Namibian Resources PLC, 2004).

Storm Diamond Mining (Pty.) Ltd. of Namibia (a subsidiary of Reefton Mining NL of Australia) continued exploration of the beaches along the Skeleton Coast of northern Namibia. In 2004, Storm trenched beach terraces. Bulk samples were processed with Storm's screening plants, a dense-media separation plant, and x-ray sorting system. The company has recovered 2,629 diamonds that weigh 494.4 carats since exploration was initiated in 2002 (Reefton Mining NL, 2005, p. 3).

Mineral Fuels

Namibia, which had no domestic production of coal, gas, or oil, was import-dependent for most of its energy needs. The hydroelectric dam at Ruancana provided 249 megawatts (MW) of power, and an additional 600 MW was imported from South Africa under arrangements, which were to expire in 2006, with Eskom Ltd. and the South African Power Pool. The country's hopes for meeting future energy requirements rested on development of its hydroelectric potential and offshore natural gas reserves.

In January 2004, National Petroleum Corp. of Namibia (Pty) Ltd. (Namcor) acquired a 10% interest in the offshore Kudu Gasfield, which is located 170 km offshore Oranjemund, from the South Africa-based, but Malaysian-owned Energy Africa Ltd., which retained a 90% interest. In May, Tullow Oil plc of Ireland acquired Energy Africa, and by July, Tullow had a development agreement, which proposed that gas from the Kudu Field be supplied to a proposed 800-MW power station that was to be built 25 km from Oranjemund, with Namibia Power Corp. (Pty) Ltd. in place.

In 2004, the Ministry held the fourth Petroleum Licensing Round, which was expected to attract additional international oil company interest, especially offshore. Bids closed in 2005.

Also in 2004, the venture between the First African Oil Corp. (a subsidiary of Circle Oil plc of the United Kingdom) (90% interest) and Namcor (10%) evaluated about 18 blocks in the onshore Owambo Basin of northern Namibia. Hunt Overseas Oil Co. (an affiliate of the Hunt Oil Co. of the United States) acquired a multiblock reconnaissance license in the offshore Lüderitz Basin, and INA Industrija nafte d.d. of Croatia evaluated its reconnaissance rights on 24 onshore blocks in southeastern Namibia. Vanco Energy Co. of the United States withdrew from blocks 1711A and 1711B (the Kunene Prospect), offshore northern Namibia. In November, Namcor acquired blocks 1711A and B and was seeking joint-venture partners.

Outlook

The long tradition of mining in Namibia has been renewed with the reopening of the Tsumeb-area mines and smelter in 2000, the opening of the Skorpion zinc project in 2003, the expansion of fluorspar and gold mines, and the continued success of offshore diamond exploration and development. These successes and higher world commodity prices are encouraging further exploration for base metals, diamond, gold, and petroleum. Although offshore diamond production experienced some setbacks in recent years owing to technical or business reasons, the potential for development of diamond resources remains strong, and production is expected to increase in 2005 and later. Such new mine developments and the potential for new value-added gemstone cutting and polishing, metal-processing, and other mineral-based manufacturing industries should maintain the minerals sector's position as a significant segment of the economy of Namibia for the foreseeable future.

The Government's ability to attract new investment to develop natural gas resources and to harness the hydroelectric power potential of the Kunene River will strongly influence future economic growth. In the longer run, greater development of the regional transportation infrastructure in northern Namibia, stimulated by the completion of the Trans Kalahari and Trans Caprivi highways, could see Walvis Bay become a significant export route for new mineral developments in Angola and in the landlocked countries of Botswana and Zambia. With a climate that is among the driest in the world, Namibia will continue to deal with the lack of water resources as a constraint on development.

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References Cited

AngloGold Ashanti Limited, 2005, 04 annual report: Johannesburg, South Africa, AngloGold Ashanti Limited, 188 p.

Anglo American plc, 2005, Annual report 2004: London, United Kingdom, Anglo American plc, 124 p.

Bank of Namibia, 2005, Annual report 2004: Windhoek, Namibia, Bank of Namibia, 139 p.

Diamond Fields International Ltd., 2004, Diamond Fields announces ship acquisition and reports diamond production: Vancouver, British Columbia, Canada, Diamond Fields International Ltd. press release, October 14, 2 p.

Kumba Resources Ltd., 2005, Annual report 2004: Pretoria, South Africa, Kumba Resources Ltd., 184 p.

Namdeb Diamond Corp. (Pty) Ltd., 2005, Namdeb annual review 2004: Windhoek, Namibia, Namdeb Diamond Corp. (Pty) Ltd., 36 p.

Namibian Resources PLC, 2004, Namibian Resources cleared to start mining its high-grade Saltztal diamond area: London, United Kingdom, Namibian Resources PLC press release, December 20, 1 p.

Olson, D.W., 2005, Gemstones: U.S. Geological Survey Mineral Commodity Summaries 2005, p. 68-69.

Paladin Resources Ltd., 2004, Quarterly report for period ending—30 June 2004: Subiaco, Australia, Paladin Resources Ltd., July 23, 3 p.

Paladin Resources Ltd., 2005, Langer Heinrich Uranium Project: Subiaco, Australia, Paladin Resources Ltd., November, 4 p.

Reefton Mining NL, 2005, Financial report for the half-year ended 31 December 2004: Perth, Australia, Reefton Mining NL, March 16, 20 p.

Tassel, Arthur, 2004, Skorpion—Namibia's "new generation" zinc producer: African Mining, v. 9, no. 1, January-February, p. 26-33.

Internet References Cited

Afri-Can Marine Minerals Corp., 2004, Unaudited consolidated financial statements for the second quarter ending February 29, 2004, accessed July 24, 2004, at URL http://www.afri-can.com/financials.shtml.

International Monetary Fund, 2005 (September), Zambia, World Economic Outlook Database, accessed September 30, 2005, via URL http://www.imf.org/ external/pubs/ft/weo/2005/02/data/index.htm.

Katsawara, Tonderai, 2004 (August 24), Namdeb's CTF inaugurated at Luderitz, accessed August 31, 2004, at URL http://www.namibian.com.na/2004/august/marketplace/0460008A4B.html.

Ministry of Trade and Industry, 2003, Major investment opportunities—Spatial development initiative, Potential Mining Projects, accessed July 24, 2004, at URL http://www.mti.gov.na/invopps_text/sdi_mining.htm.

Rössing Uranium Ltd., 2005a, 2004 performance, accessed July 15, 2005, at URL http://www.rossing.com/2004performance.htm.

Rössing Uranium Ltd., 2005b (May), On the way to full production, e-Rössing Bulletin, accessed July 15, 2005, at URL http://www.altonsa.co.za/rossing/reports/e-Rossing Bulletin May2005.pdf.

World Bank Group, 2005, Population 2004, World development indicators 2005, accessed November 28, 2005, via URL http://devdata.worldbank.org/data-query/SMSeriesSelection.asp.

World Nuclear Association, 2005 (July), Uranium production figures—1996-2004, accessed December 1, 2005, at URL http://world-nuclear.org/info/uprod.htm.

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Major Publications

Chamber of Mines of Namibia, Annual Report.

Geological Survey of Namibia, 1992. The Mineral Resources of Namibia, 598 p.

Ministry of Mines and Energy, Namibia: List of producing mines, accessible at URL http://www.mme.gov.na/mines/mines-and-products.html.

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TABLE 1
NAMIBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
METALS						
Arsenic, white, 99% arsenic trioxide		--	914	880	389	1,264
Columbium (niobium) and tantalum:						
Gross weight, tantalite concentrate		--	--	23 e	100 e	30 e
Ta content (36%)		--	--	8	36	11 e
Copper:						
Mine output, concentrate (26% - 30% Cu):						
Gross weight		19,099	53,790	63,997	64,882 r	58,792
Cu content		5,620	12,393	18,012	16,175 r	11,174
Metal, blister:[2]						
From domestic concentrates		5,082	18,386	17,850	16,106	14,800 e
From imported toll concentrates		--	8,629	8,853	9,930	9,900 e
Total		5,082	27,015	26,703	26,036	24,704
Gold	kilograms	2,417	2,706	2,815 r	2,508 r	2,205
Lead, mine output, concentrate:						
Gross weight		20,665	25,565	24,140	31,453	27,338
Pb content of Pb and Pb/Zn concentrates		11,114	12,088	13,809	18,782	14,338
Silver:						
Mine output, Ag content of concentrate	kilograms	9,287	20,396	43,632	45,100	27,153
Metal, refined, primary[2]	do.	8,790	18,150	12,020	18,140	14,815
Tin:						
Gross weight, concentrates		--	--	--	72	25 e
Sn content (60%)		--	--	--	43	15 e
Uranium, U_3O_8		3,201	2,640	2,751	2,401	3,583
Zinc, mine output, concentrate (49% - 54% Zn):						
Gross weight		73,535	70,923	77,587	107,920	123,372
Zn content of Zn and Pb/Zn concentrates		39,126	37,622	42,685	60,500	66,028
Metal, refined, primary[2]		--	--	35	47,436	120,533
INDUSTRIAL MINERALS						
Diamond, gem	thousand carats	1,552	1,487	1,562	1,481	2,004
Fluorspar, acid grade (97% $CaFl_2$)[3]		66,128	81,551	81,084	79,349	104,785
Gypsum		588	--	--	--	--
Salt		523,009	543,218	630,159	697,914	754,351
Semiprecious stones:						
Agate		96	138	190	123 r	158
Amethyst	kilograms	4,850	4,500 e	4,500 e	300 r	41,367
Blue chalcedony	do.	NA	NA	NA	124	69
Chrysocolla	do.	--	2,685	13	-- e	--
Garnet	do.	134	150 e	150 e	-- r	115
Picture stone		NA	NA	NA	326	240
Pietersite		20	5,370	--	11 r	9
Rose quartz		74	30	--	93 r	--
Sodalite		457	46	1,691	174 r	--
Tourmaline	kilograms	390	--	--	218 r	102
Stone:						
Dolomite		--	19,593	--	15,401 r	13,536
Granite		7,222	5,723	24,754	27,456 r	25,492
Marble		24,426	18,337	3,182	4,523 r	8,356
Sodalite		--	--	NA	704	138
Sulfur, pyrite concentrate:						
Gross weight (49% - 51% S)		11,967	68,674	3,633	31,786	3,658
S content		5,704	34,491	1,874	16,390	1,835
Wollastonite		441	284	742	585 r	406

eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. rRevised. NA not available. --Zero.

[1]Table includes data available through October 2005.

[2]Includes products of imported concentrate.

[3]Fluorspar production shown in wet metric tons; approximately 9% moisture.

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TABLE 2
NAMIBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Arsenic		Ongopolo Mining and Processing Ltd.	Plant at Tsumeb smelter	1,000 refined arsenic trioxide.
Columbium (niobium) and tantalum		Albaca Mining Co. [Central African Mining & Exploration Co. (United Kingdom), 100%[2]]	Three Aloes Mine, 10 kilometers south of Uis	36 tantalite concentrates.
Do.		IMG Tantalum [AFB Exploration (Pty.) Ltd. (Germany)]	Mine in Tantalite Valley in Karas region, north of Orange River	Closed.
Copper:				
Ore		do.	Ojithase copper mine, near Tsumeb	12,000 copper in concentrates; 32,000 pyrite concentrates.
Do.		do.	Komabat copper mine, 50 kilometers south of Tsumeb	8,000 copper in concentrates.
Do.		do.	Tsumeb West Mine	4,000 copper in concentrates.
Metal		do.	Copper smelter at Tsumeb	30,000 blister copper; 20 silver; 200 kilograms gold.
Diamond:				
Mining	carats	Namdeb Diamond Corp. (Pty.) Ltd. (Government, 50%, and De Beers Centenary AG, 50%)	Mining Area 1, from Orange River to 145 kilometers north of Orangemund, includes Pocket Beach Site 2	800,000.
Do.	do.	do.	Orange River Mines, from mouth of Orange River east to Sendelingsdrif; includes the Daberas Mine	120,000.
Do.	do.	do.	Northern Areas and Elizabeth Bay Mines, 24 kilometers south of Luderitz	180,000.
Do.	do.	do.	Beach and Marine contractors	25,000.
Do.	do.	De Beers Marine Namibia (De Beers Centenary AG, 70%, and Namdeb Diamond Corp. (Pty.) Ltd., 30%)	Atlanta 1 license area, offshore of Sperrgebiet	850,000.
Do.	do.	Sakawe Mining Corp. (LL Mining Corp. BV of Israel)	Offshore near Luderitz Bay	100,000.
Do.	do.	Diamond Fields (Pty.) Ltd. of Namibia (Diamond Fields International Ltd. of Canada, 100%)	Mining License 111, offshore Luderitz	53,000.[1]
Do.	do.	Diaz Exploration (Pty.) Ltd.	Marine mining	15,000.
Do.	do.	Storm Diamond Mining (Pty.) Ltd., (Reefton Mining NL of Australia, 100%)	Beach terrace deposits, Skeleton Coast (Production from ongoing exploration activity)	350.
Processing	do.	Hard Stone Processing (Seber NV, 100%)	Diamond cutting and polishing plant at Windhoek	NA.
Do.	do.	LLD Diamonds Namibia (Leviev Group of Israel, 100%)	Diamond cutting and polishing plant at Windhoek	150,000 carats.
Do.	do.	Mars Investment Holding (Pty.) Ltd.	Diamond cutting and polishing plant at Walvis Bay	NA.
Do.	do.	NamCot Diamonds (Pvt.) Ltd. (Steinmetz Group, 100%)	Diamond cutting and polishing plant at Okahandja, 70 kilometers north of Windhoek	NA.
Do.		NamDiamonds Inc.	Diamond cutting and polishing plant at Windhoek	Closed.
Do.	do.	NamGem Diamond Manufacturing Co. (Pty.) Ltd. (Namdeb, 100%)	Diamond cutting and polishing plant at Okahandja	50,000 stones.
Do.	do.	Tornado Enterprises (Kurashkin, Slatkov, 100%)	Diamond cutting and polishing plant at Windhoek	NA.
Fluorspar	do.	Okorusu Fluorspar (Pty.) Ltd.	Mine and plant at Okorusu	105,000 acid-grade fluorite.
Gold	kilograms	Anglogold (Pty.) Ltd. of Namibia	Navachab Gold Mine	2,500
Salt:		Salt Company (Pty.) Ltd.	Swakopmund	120,000.
Do.		Salt & Chemicals Ltd.	Salt pan at Walvis Bay	650,000.
Do.		Walvis Bay Salt Refiners (Pty.) Ltd.	Salt refinery at Walvis Bay	650,000.
Do.		Cape Cross Salt (Pty.) Ltd.	NA.	15,000.

See footnotes at end of table.

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TABLE 2--Continued
NAMIBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Uranium	Rössing Uranium Ltd. (Rio Tinto Group, 68.6%; Government of Iran, 15%; Industrial Development Corp. of South Africa Ltd., 10%; Government of Namibia, 3.5%)	Rössing Mine, 65 kilometers northeast of Swakopmund	4,800 uranium oxide.
Wollastonite	Namibia Mineral Development Co. (Pty.) Ltd.	Uskos Mine	800 wollastonite; 20,000 dolomite.[e]
Zinc:			
Mine	Rosh Pinah Zinc Corp. (Pty.) Ltd. (Kumba Resources Ltd., 100%)	Rosh Pinah Mine, near Rosh Pinah	110,000 zinc in concentrates; 20,000 lead in concentrates; 25 silver in concentrates.
Do.	Skorpion Mining Co. (Anglo American plc, 100%)	Skorpion Mine, 25 kilometers north of Rosh Pinah	1,500,000 ore.
Metal	Namzinc (Pty.) Ltd. (Anglo American plc, 100%)	Skorpion solvent extraction facilities and electrowinning refinery, 25 kilometers north of Rosh Pinah	150,000 refined zinc.

[e]Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

[1]In joint venture with contract miner, Samicor Mining Services (Pty.) Ltd.. Joint venture ended in October 2004.

[2]Divested interest in early 2005.

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The Mineral Industry of Nigeria

By Philip M. Mobbs

The hydrocarbon sector dominated the Nigerian economy. According to data compiled by the U.S. Energy Information Administration (2005), Nigeria's production of crude petroleum and condensate exceeded that of Kuwait and the United Arab Emirates in 2004, which moved Nigeria up to the position of ninth leading producer in the world (by volume). Nigeria, which was a member of the Organization of the Petroleum Exporting Countries (OPEC), remained Africa's leading oil producer. In addition to hydrocarbons, artisanal miners and companies produced columbium (niobium) and tantalum, gold, lead, tin, and zinc ores; copper, lead, steel, and tin; and industrial mineral commodities such as barite, cement, clays, coal, feldspar, gemstones, gypsum, phosphate rock, and stone.

In 2004, hydrocarbons accounted for about 34% of the country's gross domestic product (GDP). Revenues of $25.1 billion, which were attributed to natural gas and oil, accounted for 86% of total Government revenues. Controversy continued to cloud the Government's distribution of oil income (Central Bank of Nigeria, 2005, p. 127, 140; Adeshida and Aziken, 2004§[1]; Alabi, Okafor, and Bassey, 2004§; Akwa Ibom State Government, undated§).

Real GDP growth was 6% in 2004. The GDP based on purchasing power parity was estimated to be about $159.8 billion, and the GDP per capita based on purchasing power parity was estimated to be about $1,120. Despite the nation's significant oil income, Nigeria was 162d on a list of 178 countries ranked by GDP per capita by the International Monetary Fund. Nigeria's GDP per capita rank was skewed by its position as the most populous country in Africa. Estimates of Nigeria's population in 2004 varied from about 126 million to about 143 million, which was about as much as the combined population of the next two most populous countries in Africa (Egypt and the Democratic Republic of the Congo). When compared to other countries on a list of the world's top 10 leading oil-producing nations, only China, Russia, and the United States had larger populations than Nigeria (U.S. Energy Information Administration, 2005; International Monetary Fund, 2005§; U.S. Central Intelligence Agency, 2005§).

Government Policies and Programs

Under the Mining and Minerals Decree No. 34 of 1999, the Federal Government holds all mineral rights. In February 2004, the Government launched the Nigerian Extractive Industries Transparency Initiative in conjunction with the international Extractive Industries Transparency Initiative. The Nigerian Extractive Industries Transparency Initiative Bill, which was drafted in 2004, would require annual revenue and tax audits of companies that participate in the mining or petroleum sectors.

The Government began a new economic reform program in 2004. Proposals under the National Economic Empowerment and Development Strategy (NEEDS) included the diversification of the national economy and the deregulation, privatization, and promotion of the industrial sector. Other NEEDS goals were to improve the enforcement of contracts; to improve the power generation, telecommunication, and transportation infrastructure; to improve the security of lives and property; to improve access to finance; and to increase local processing of minerals and exports of processed mineral commodities. The NEEDS also proposed to reduce further the high cost of project finance, which adversely affected domestic companies without recourse to international funding. The prime interest rate in Nigeria dropped to about 19.2% in 2004 from 26% in 2001, which was significantly higher than the average prime rate of about 4.5% available in the United States in 2004 (Nigerian National Planning Commission, 2004, p. 9-11, 76-78; Katz and others, 2005, p. 91; Board of Governors of the Federal Reserve System, 2005§).

The NEEDS identified several constraints on the development of the nation's solid mineral sector, which included the dearth of proven mineral reserves, illegal mining, the lack of infrastructure, the lack of mineral production and processing capacity, the smuggling of minerals out of the country, the uncompetitive legal and regulatory structure, and unfavorable domestic fiscal policies. The Government proposed to address these problems by enforcing existing regulations that impact artisanal and small mining operations and by completing a national register of mining leases, licenses, and rights. The Government also proposed to authorize the Nigerian Geological Survey Agency to regulate the solid mineral sector. Other proposals made in the NEEDS included the completion of a comprehensive geologic survey of the 923,768-square-kilometer nation, the creation of support services and technical assistance programs for artisanal and small-scale mining operations, the establishment of licensed mineral-buying centers, the promotion of environmental awareness, the promotion of mining cooperatives, and a review of mining legislation (Nigerian National Planning Commission, 2004, p. 77-79).

In October, the Government allocated $165,000 to a program that would fund mineral processing assistance, mining skills development, and other training for artisanal and small-scale miners. In December, the World Bank Group approved a $120 million Sustainable Management of Mineral Resources Project that would fund many of the initiatives proposed by the NEEDS.

To infuse new funding into moribund Government-owned mineral operations and to combat the international reputation for corruption, inefficiency, and political patronage that many of the public enterprises in Nigeria had acquired, the Government continued to attempt to commercialize state-owned companies (Bureau of Public Enterprises, 2003§). The Federal Government's Bureau of Public Enterprises (BPE), which was part of the National Council on Privatisation, managed the process through which mineral commodity production and processing companies were privatized. The short-term success

[1]References that include a section mark (§) are found in the Internet References Cited section.

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of the privatization program was limited owing to the continued financial, legal, and political difficulties experienced by the domestic and international companies and consortia that had been selected by the BPE to acquire state-owned enterprises in 2003 and 2004 (Gabriel, 2004§; Nigerianewsnow.com, 2004§; Ige, 2005§; Oduniyi, 2005§).

The Pensions Act of June 2004 established a new national pension program that required both private sector employees and employers to contribute a minimum of 7.5% of an employee's emoluments (basic salary plus housing and transportation allowances) to the fund. Employers also were required to maintain life insurance policies for each employee in an amount no less than three times the employee's annual compensation. Development of applicable pension regulations was underway (Katz and others, 2005, p. 50-56).

Trade

In 2004, official oil exports, which were valued at $20.67 billion, and natural gas exports, which were valued at $2.02 billion, accounted for 96.4% of total Nigerian exports. Official crude oil exports were reported to be 741 million barrels (Mbbl), which was a 10% increase compared with oil exports in 2003. Estimates of illegal oil exports, which primarily were siphoned from crude oil pipelines in the Niger Delta, ranged from 15 million to 70 million barrels per year. Of the official crude oil exports in 2004, about 281.6 Mbbl (or about 38% of total crude oil exports) was exported to the United States, which was a 10.5% increase compared with that of 2003; 96.3 Mbbl to India, which was up from about 87.5 Mbbl in 2003; 62.2 Mbbl to Spain, which was an increase of 10.1% compared with that of 2003; about 48.2 Mbbl to France, which was a 0.1% decline compared with that of 2003; about 39.3 Mbbl to Brazil, up from a revised 26.7 Mbbl in 2003; and 36.3 Mbbl to countries in West Africa, which was a 10% increase compared with that of 2003 (Central Bank of Nigeria, 2005, p. 159, 164; Agence France-Presse, 2004§).

In 2004, imports of refined petroleum products, which were valued at $2.1 billion, accounted for 18.6% of total imports compared with 25.3% in 2003. Refined petroleum imports declined from a revised $2.65 billion in 2003 because of improved domestic refinery operations. To promote local production, the Government prohibited the importation of barite, bentonite, and kaolin. Imports of cement in bags and bulk cement in volumes of less than 10,000 metric tons (t) also were banned (Central Bank of Nigeria, 2005, p. 159; Katz and others, 2005, p. 61-62).

Commodity Review

Metals

Aluminum.—The Government and Ferrostaal AG concluded negotiations in which Ferrostaal's interest in the Aluminum Smelter Co. of Nigeria Ltd. (Alscon) declined to 7.5% from 20%. The subsequent tender of 77.5% equity in Alscon by the BPE was acquired by a consortium lead by the BFI Group Corp. of the United States. The BFI Group submitted a $1 million non-refundable bid bond, but by August, the BFI Group was disqualified by the BPE for failure to pay 10% of the $410 million purchase price within 15 working days after the receipt of the confirmation of the successful bid. The BFI Group claimed that it had not received timely notification and that the contract called for payment within 15 working days after the Share Purchase Agreement was signed. After the failure of subsequent negotiations with the BPE, the BFI Group pursued its options with the Nigerian and United States Governments (Akwaya, 2004§; Ige, 2005§).

Copper.—In 2004, Sun & Sand Industries Ltd. began to remelt copper scrap and to produce copper alloys and ingots at a plant at Ota in Ogun State.

Iron and Steel.—In 2003, the Government had awarded a 10-year contract to complete the construction of the Ajaokuta Steel Co. Ltd. (ASC) plant to a consortium managed by Solgas Energy Ltd. of the United States (initial construction of the ASC facility had begun in 1980.) The Government reportedly had agreed to pay ASC workers' salaries through yearend 2004, but in May 2004, the Government announced that it would unilaterally cut public sector iron and steel workers' salaries by more than 50% for the remainder of the year. In August 2004, workers at ASC went on strike and the Government terminated Solgas' ASC contract. The Government subsequently awarded Global Infrastructure Holdings Ltd. (a subsidiary of Ispat Industries Ltd. of India) a 10-year concession to complete and operate the ASC plant. In November, Global Infrastructure commissioned a 130,000-metric-ton-per-year (t/yr)-capacity wire rod mill to process steel billet imported from the Ukraine. In December, Global Infrastructure began steel bar production at the plant's light steel mill and initiated procedures to start up the blast furnace in 2005 (Steel Times International, 2005; Nwachuku, 2004§; Oduniyi, 2005§).

To facilitate the Government's privatization of the steel plant and rolling mill of Delta Steel Co. Ltd., the BPE began negotiations in 2004 to pay compensation to communities from which the Government appropriated land for the Delta Steel facility. The compensation was for crops destroyed in 1979 when construction of the Delta Steel facility began. In the 2004 request for bids to become the core investor of Delta Steel, BUA International Ltd. submitted the highest bid, but after initial negotiations with BUA, the BPE cancelled the tender (Thisday, 2004§).

The BPE's privatization of the National Iron Ore Mining Co. Ltd. and the Jos, the Kaduna, the Katsina, and the Oshogbo steel rolling mills proceeded fitfully in 2004. The Katsina Investment and Property Development Co. Ltd., which was a Katsina State government company formed for the bid, was the high bidder for the Katsina Steel Rolling Co. Ltd., but the National Council on Privatisation revoked the bid (Okwe and Ohu, 2004§).

New steel operations in Nigeria included an electric-arc-furnace remelt facility and a 100,000-t/yr rolling mill (which would produce concrete-reinforcing bar) that were built for African Steel Mills Ltd. at Ikorodu in Lagos State and a 30,000-t/yr concrete-reinforcing bar mill, which would be operated by Sunflag Steel (Nigeria) Ltd., that was built at the Iganmu Industrial Estate complex in Lagos (Nav Bharat Engineering Works, 2004§; Yaya, 2004§).

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Industrial Minerals

Cement.—In 2004, domestic consumption of cement was estimated to be between 10 million metric tons per year (Mt/yr) and 12 Mt/yr. Nigeria's installed cement production capacity was about 6 Mt/yr. Domestic production was supplemented by imported bulk cement, which was bagged primarily at terminals in or near Lagos and Port Harcourt. The Central Bank of Nigeria (2005, p. 70-71) reported a lull in domestic cement production in 2004 because a number of cement companies had suspended or terminated operations. Increased fuel costs impacted the remaining companies, most of which were powered by fuel oil (Holcim Ltd., 2005, p. 40; U.S. Securities and Exchange Commission, 2005§).

Unlike the metals sector privatization attempts, the rejuvenation of the cement sector by the infusion of funds after the privatization of the state-owned cement companies has been generally successful. The Lafarge Group of France obtained the formerly state-owned 900,000-t/yr-capacity Ashakacem Plc in Gombe State and the two privatized facilities of West African Portland Cement Co. Plc (WAPCO) in Ogun State when it acquired Blue Circle Industries Ltd. in 2001. In 2003, WAPCO commissioned a new 1-Mt/yr-capacity plant at Ewekoro to replace the 40-year-old 600,000-t/yr plant and at yearend 2004, WAPCO's Ewekoro and Shagamu plants had a combined capacity of 2.1 Mt/yr (U.S. Securities and Exchange Commission, 2005§).

Dangote Industries Ltd. of Nigeria, which bagged imported bulk cement in Lagos and Port Harcourt, acquired local manufacturing capacity in 2001 when it became the core investor in the Benue Cement Co. Plc. Rehabilitation of the 900,000-t/yr Benue plant at Gboko was completed in 2004. Dangote also proceeded with a proposed 4.7-Mt/yr-capacity cement plant at Obajana in Kogi State, a 2.3-Mt/yr cement plant at Ibese in Ogun State, and a 2.3-Mt/yr cement plant in Odukpani near Calabar in Cross River State (Dangote Group, 2004§).

In 2004, the Cement Co. of Northern Nigeria, in which Scancem International ANS had acquired 51% interest in 2000, finished the rehabilitation of the 500,000-t/yr-capacity plant at Sokoto, and Edo Cement Co. Ltd., which also was a subsidiary of Scancem, continued the rehabilitation of the cement plant formerly operated by the Bendel Cement Co. Ltd. at Okpella. Edo had acquired the majority interest in Bendel in 2003 and, in 2004, began bagging imported cement at the facility (Aderinokun, 2003§).

Employees of the coal-burning Nigercem Plc. reportedly had not been paid since June 2000. In October 2002, the idle operation was privatized; Eastern Bulkcem Co. Ltd. (EBC) acquired 60% interest. EBC, which bagged imported bulk cement near Port Harcourt, had proposed to rehabilitate the Nigercem facility, but there was no apparent activity in 2004 (Obi, 2005§).

In 2003, investors joined with the Akwa Ibom State government to form Quality Cement Co. Ltd. (Quacem) and proposed to build a facility at Ikot Abasi. Quacem initially was to bag imported cement and eventually would manufacture cement. At yearend, the scheduled October 2004 bagging startup date had slipped to mid-2005 (Akwa Ibom State Government, 2005§).

Nitrogen.—The sale in 2003 of the National Fertilizer Co. of Nigeria Ltd. (NAFCON) to the joint venture of Sino Africa Petrochemical Co. Ltd. and Foskor Ltd. of South Africa was voided by the BPE after the joint venture failed to provide the initial payment. The Government's continuing investigation into the financial status of NAFCON reported unverified claims against the company of about $202 million, of which separation allowances and unpaid wages of former employees accounted for about $72 million. In 2004, the BPE prepared to request another round of bids for NAFCON and prequalified several companies interested in bidding to acquire the NAFCON facility, which had produced ammonia and urea until financial difficulties forced the company to stop operations in 1999 (Guardian, The, 2004b§; Nigerianewsnow.com, 2004§; Nwigwe, 2004§).

Mineral Fuels

Coal.—The Ministry of Solid Minerals Development received a $410,800 grant from the U.S. Trade and Development Agency for a feasibility study on the redevelopment of Nigeria's coal resources. For the 20 years prior to the start of the civil war in the mid-1960s, Nigeria had produced between 500,000 t/yr and 1 Mt/yr of coal (Oyelaran-Oleyinka, 1995§; Guardian, The, 2004a§).

Natural Gas.—Construction continued on Nigeria Liquefied Natural Gas Ltd.'s (NLNG) natural gas liquefaction trains 4 and 5 at Finima on Bonny Island. Completion of the trains was expected in 2005. In July, NLNG approved the construction of the 4-Mt/yr-capacity liquefied natural gas (LNG) train 6, which, when completed in 2007, would raise the NLNG's facility's capacity to about 22 Mt/yr of LNG and 5 Mt/yr of liquefied petroleum gas. In 2004, the Serious Fraud Office of the United Kingdom and the U.S. Federal Bureau of Investigation initiated separate investigations into alleged bribes paid by the TKSJ consortium, which comprised (in order of consortium initials) Technip S.A. of France, M.W. Kellogg Co. of the United States (which subsequently was acquired by Halliburton Co. and merged with Halliburton's Brown and Root division), Snamprogetti S.p.A. of Italy, and Japanese Gas Corp. The alleged bribes were to obtain contracts to build the initial LNG trains for NLNG. In 2003, the Tribunal de grande instance de Paris launched an investigation into alleged bribery by TKSJ (Africa Energy Intelligence, 2004; Nigeria Liquefied Natural Gas Ltd., 2004).

Engineering work continued on the proposed Brass River LNG facility, the proposed Escravos gas-to-liquids project, and the East Area Additional Oil Recovery project, which included a proposed 42,000-barrel-per-day (bbl/d) expansion of the current (2004) 38,000-bbl/d-capacity natural-gas-liquids (NGL) plant on Bonny Island (Igbikiowubo, 2004§).

In November, the World Bank authorized a $125 million guarantee to support the West African gas pipeline, and in December, West African Gas Pipeline Co. Ltd. (WAPCo) approved the final investment decision to proceed with the construction of the $590 million 678-kilometer pipeline that was designed to deliver Nigerian natural gas to Benin, Ghana,

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and Togo. The pipeline was expected to be operational in 2006 and was expected to transport about 13.3 million cubic meters per day of natural gas at maximum capacity (West African Gas Pipeline Co. Ltd., 2004).

Petroleum.—Despite civil violence directed at the international oil company facilities and intertribal conflicts that adversely impacted production operations, Nigerian oil production continued to climb in response to increased international oil prices and the associated increased production quota authorized by OPEC for the last six months of the year (Organization of the Petroleum Exporting Countries, 2005, p. 6).

The BPE received numerous responses to the request for expressions of interest in the privatization of 51% interest in each of Nigerian National Petroleum Corp. (NNPC)'s four crude oil refineries that it issued in 2003. Most of the responses, however, were from consortia of domestic and international small- to medium-sized entrepreneurial, marketing, and trading companies and not from major international oil companies. In 2004, operations at NNPC's Kaduna and Warri refineries were suspended for about a month because of vandalization of crude oil supply pipelines. The Kaduna refinery had been closed from April to November 2003 for the same reason.

In March 2004, the Government proposed to increase domestic refining capacity to 2 million barrels per day (Mbbl/d) by 2006 from the current (2004) capacity of about 445,000 bbl/d, although actual refined product output was significantly lower. To supplement the production of NNPC's refineries, the Government had issued 18 provisional licenses for private refineries. In 2004, the private refinery license holders were seeking primarily financing and technical partners. In December 2004, the NNPC requested that its joint venture partners refine in Nigeria at least one-half of the oil they produced in Nigeria (Nwama, 2004§; Odunyi and Ezigbo, 2004§).

Outlook

The Government expects to continue efforts to attract local and foreign investors to the Nigerian mineral industry, but except for coal, columbium (niobium) and tantalum, granite, gypsum, iron ore, limestone, natural gas, oil, and tin, known resources of most mineral commodities have not been considered large enough to generate significant international interest. Some exploration has been conducted in Nigeria for higher-value commodities, such as gold and tantalum. The completion of comprehensive geologic and geophysical surveys may generate additional prospects that could attract the interest of exploration companies. National industrial development could be enhanced by the rehabilitation of the iron and steel sector.

Nigeria's extensive deposits of limestone, the infusion of domestic and foreign investment in recently privatized cement operations, and the Government's promotion of natural gas, which traditionally had been burned off at oilfield gathering stations, has resulted in the proposed construction of new cement plants and the rehabilitation or expansion of existing plants that could nearly triple Nigerian cement production capacity by 2007.

The development of additional natural gas infrastructure in Nigeria could attract additional energy-intensive mineral processing facilities. The rising price of oil on the international market could provide an opening for the redevelopment of Nigerian coal reserves if, within the limitations of international treaties such as the Kyoto Protocol, domestic and international electricity-generating plants increase their demand for coal.

References Cited

Africa Energy Intelligence, 2004, Nigeria—U.K. starts NLNG inquiry—Too: Africa Energy Intelligence, no. 380, November 3, p. 7.

Central Bank of Nigeria, 2005, Annual report and statement of accounts for year ended 31st December, 2004: Abuja, Nigeria, Central Bank of Nigeria, 190 p.

Holcim Ltd., 2005, Annual report 2004: Jona, Switzerland, Holcim Ltd., 160 p.

Katz, M., Bartsch, U., Gobat, J., Nielsen, L., and Villafuerte, M., 2005, Nigeria—Selected issues and statistical appendix: Washington, DC, International Monetary Fund Country Report No. 05/303, August, 109 p.

Nigeria Liquified Natural Gas Ltd., 2004, NLNG shareholders take final investment decision on train six: Lagos, Nigeria, Nigeria Liquified Natural Gas Ltd. press release, July 7, 2 p.

Nigerian National Planning Commission, 2004, Meeting everyone's needs—National economic empowerment and development strategy: Abuja, Nigeria, Nigerian National Planning Commission, 118 p.

Organization of the Petroleum Exporting Countries, 2005, OPEC annual statistical bulletin 2004: Vienna, Austria, Organization of the Petroleum Exporting Countries, 144 p.

Steel Times International, 2005, Ispat industries revives Nigerian steel company: Steel Times International, v, 29, no, 1, January, p. 6.

U.S. Energy Information Administration, 2005, Table 11.1a-b—World crude oil production: Washington, DC, Monthly Energy Review, August, p. 150-151.

West African Pipeline Co. Ltd., 2004, Shareholders of West African Gas Pipeline Company Limited take final investment decision (FID) on WAGP: Abuja, Nigeria, West African Gas Pipeline Co. Ltd. press release, December 24, 2 p.

Internet References Cited

Aderinokun, Kunle, 2003 (January 6), SCANCEM commits $45m to CCNN—Two other firms, accessed January 17, 2003, at URL http://www.thisdayonline.com/archive/2003/01/06/20030106bus09.html.

Adeshida, Abayomi, and Aziken, Emmanuel, 2004 (August 23), Why North wants oil dichotomy back—Makarfi, accessed August 24, 2004, at URL http://www.vanguardngr.com/articles/2002/cover/f323082004.html.

Agence France-Presse, 2004 (December 29), Nigeria Navy buys 15 patrol boats to fight oil smuggling, accessed October 3, 2005, at URL http://www.defensenews.com/story.php?F=575513&C=mideast.

Akwaya, Cletus, 2004 (August 18), NCP to revisit ALSCON sale, accessed August 19, 2004, at URL http://www.thisdayonline.com/news/20040819news08.html.

Akwa Ibom State Government, 2005 (June 2), Community commends cement company, accessed July 1, 2005, at URL http://www.akwaibomstategov.com/news2-2.asp?ID=2283.

Akwa Ibom State Government, [undated], Understanding resource control—Continue, accessed October 6, 2005, at URL http://www.akwaibomstategov.com/understanding_resource_control Continue.htm.

Alabi, Julius, Okafor, Chido, and Bassey, Aniekan, 2004 (February 19), Oil states laud signing of onshore, offshore bill, accessed February 19, 2004, at URL http://www.guardiannewsngr.com/news/article02.

Board of Governors of the Federal Reserve System, 2005 (September 22), Bank prime loan rate changes—Historical dates of changes and rates, accessed October 3, 2005, at URL http://research.stlouisfed.org/fred2/data/PRIME.txt.

Bureau of Public Enterprises, 2003, FAQ, accessed February 2, 2005, at URL http://www.bpeng.org/10/0317731656532b.asp?DocID=93&MenuID=34.

Dangote Group, 2004, Cement division, accessed July 1, 2005, at URL http://www.dangote-group.com/cement.htm.

Gabriel, Omoh, 2004 (July 5), Privatisation blues in Nigeria—Alscon another NITEL in the waiting, accessed July 13, 2004, at URL http://www.vanguardngr.com/articles/2002/business/b305072004.html.

Guardian, The, 2004a (July 2), Govt secures N55.76m grant for coal mining operations, accessed July 2, 2004, at http://www.guardiannewsngr.com/business/article05.

Digitized by Google

Guardian, The, 2004b (April 19), NAFCON owes creditors N27 billion, accessed April 19, 2004, at URL http://www.guardiannewsngr.com/business/article08.
Igbikiowubo, Hector, 2004 (September 20), NNPC—ExxonMobil to spend $1.275b on gas liquids project, accessed September 20, 2004, at URL http://www.vanguardngr.com/articles/2002/nationalx/nr220092004.html.
Ige, Ise-Oluwa, 2005 (January 18), Alscon—BFI Group asks court to stop fresh privatization exercise, accessed January 31, 2005, at URL http://allaffrica.com/stories/200501190677.html.
International Monetary Fund, 2005 (September), Nigeria, World Economic Outlook Database, accessed September 30, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.
Nav Bharat Engineering Works, 2004, Clients of hot rolling mills (overseas), accessed April 7, 2005, at URL http://gearroll.com/hotrollingoverseas.html.
Nigerianewsnow.com, 2004 (June 11), NAFCON—BPE plans to sell 90% equity to core investor, accessed October 3, 2005, at URL http://nigerianewsnow.com/News/June04/110604_Nafcon.htm.
Nwachuku, Chris, 2004 (May 19), FG halves steel workers' salaries, accessed September 1, 2005, at URL http://www.thisdayonline.com/archive/2004/05/19/20040519bus03.html.
Nwama, Vincent, 2004 (December 31), Nigeria asks oil companies to refine 50% of crude locally, accessed January 1, 2005, at URL http://www.slb.com/news/story.cfm?storyid=624484.
Nwigwe, Pascal, 2004 (July 23), Six foreign firms qualify to bid for NAFCON, accessed July 19, 2004, at URL http://www.guardiannewsngr.com/news/article14.
Obi, Petrus, 2005 (April 27), Wretched of the Earth—They have not earned salary for 58 months and they are dying, accessed August 2, 2005, at URL http://sunnewsonline.com/webpages/features/citysun/2005/apr27/citysun-27-04-2005-001.htm.
Oduniyi, Mike, 2005 (January 3), Ajaokuta—Solgas drags FG to London arbitration panel, accessed January 8, 2005, at URL http://www.thisdayonline.com/nview.php?id=6119.
Oduniyi, Mike, and Ezigbo, Onyebuchi, 2004 (March 18), FG targets 2 m bpd refining capacity in 2006, accessed March 18, 2004, at URL http://www.thisdayonline.com/news/20040318news04.html.
Okwe, Mathias, and Ohu, Bayo, 2004 (November 16), Katsina govt acquires steel rolling mill, accessed November 16, 2004, at URL http://www.guardiannewsngr.com/news/article17.
Oyelaran-Oleyinka, Banji, 1995, Management of technological change in Africa—The coal industry of Nigeria, chap. 3 *of* Ogbu, O. M., Oyelaran-Oleyinka, Banji, and Mlawa, H. M., eds., Technology policy and practice in Africa, accessed July 1, 2005, at URL http://web.irdc.ca/es/ev-30777-201-1-DO_TOPIC.html.
Thisday, 2004 (July 5), Delta Steel—Group wants bid cancelled, accessed October 4, 2005, at URL http://www.naijapost.com/news/publish/printer_995.shtml.
U.S. Central Intelligence Agency, 2005, Rank order—Population, accessed September 29, 2005, at URL http://permanent.access.gpo.gov/websites/www.cia.gov/www.cia.gov/cia/publications/factbook/rankorder/2119rank.html.
U.S. Securities and Exchange Commission, 2005 (March 25), Form 20-F, Lafarge, accessed July 1, 2005, at URL http://www.sec.gov/Archives/edgar/data/913785/000112528205001573/b787721-20f.htm.
Yaya, Ibrahim, 2004 (September 20), African Steel commissions $10m plant, accessed September 26, 2004, at URL http://www.thisdayonline.com/business/20040920bus19.html.

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TABLE 1
NIGERIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
METALS						
Columbium (niobium) and tantalum:						
Gross weight, concentrate		469	610	156 r, 4	383 r, 4	100
Nb content		200 r	250 r	65 r	160 r	40
Gold	kilograms	52 4	37 4	40	50	30
Iron ore, gross weight	thousand metric tons	25 4	25 4	25	--	--
Lead:						
Lead-zinc ore		165 4	247 4	250	250	200
Metal, refined		5,000	5,000	5,000	5,000	5,000
Steel		--	--	--	--	10,000
Tin:						
Mine output, cassiterite concentrate:						
Gross weight		3,502 4	3,677 4	1,004 r	2,341 r	1,300
Sn content		2,760 4	2,870 4	790 r	1,800 r	1,000
Metal, smelter		25	25	25	25	25
INDUSTRIAL MINERALS						
Barite[5]		5,000	5,000	5,000	5,000	6,000
Cement, hydraulic	thousand metric tons	2,500	2,400	2,100	2,300 r	2,300
Clays:						
Kaolin		165,765 4	209,478 4	200,000	200,000	210,000
Unspecified		50,412 4	60,474 4	60,000	60,000	50,000
Feldspar		1,449 4	1,811 4	1,800	1,800	1,700
Gypsum		530,262 4	609,800 4	300,000 r	100,000	100,000
Stone:						
Granite	thousand metric tons	2,016 4	2,419 4	2,500	2,500	2,000
Limestone	do.	3,326 4	3,392 4	11,415 r, 4	7,408 r, 4	2,100
Marble	do.	117 4	129 4	1,551 r, 4	840 r, 4	150
Shale	do.	142 4	163 4	130	130	70
Topaz	kilograms	25 4	1 4	10	10	10
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous		11,536 4	11,495 4	43,482 r, 4	23,089 r, 4	9,000
Natural gas:						
Gross	million cubic meters	47,537 4	57,530 4	50,000 r	53,000 r	57,747 4
Dry	do.	21,945 4	39,640 4	30,000 r	31,000 r	34,411 4
Petroleum:				94%		
Crude	thousand 42-gallon barrels	783,000	823,000	773,000	825,000 r	900,400 4
Refinery products:						
Liquefied petroleum gases	do.	170	1,000	2,300	2,000	2,200
Gasoline	do.	8,000	24,400	22,400	20,000	22,000
Kerosene	do.	5,100	12,500	11,800	12,000	13,000
Distillate fuel oil	do.	7,600	18,900	18,800	19,000	21,000
Residual fuel oil	do.	10,400	21,500	17,200	17,000	18,000
Unspecified	do.	1,200	700	4,000	4,000	4,300
Total	do.	32,500	79,000	76,500	74,000	80,500

rRevised. -- Zero.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes data available through September 30, 2005.

[3]In addition to the commodities listed, amethyst, aquamarine, bitumen, copper (secondary), diamond, emerald, garnet, lime, monazite, phosphate rock, ruby, rolled-steel products, rutile, sand and gravel, sapphire, soda ash, talc, tourmaline, tungsten, zinc, and zircon are produced, but information is inadequate to estimate output.

[4]Reported figure.

[5]Considerably more barite is produced but is considered to be commercially unusable.

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TABLE 2
NIGERIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum	Aluminum Smelter Co. of Nigeria, Ltd.	Smelter at Ikot Abasi	193,000 [1]
Cement	Dangote Cement Works	Ibese	2,300,000
Do.	United Cement Co. of Nigeria	Calbar	2,000,000
Do.	West Africa Portland Cement Co. Plc	Ewekoro	1,500,000
Do.	Ashakacem plc	Ashaka	900,000
Do.	Benue Cement Co. Plc	Benue State	900,000
Do.	Nigercem Co. Plc	Nkalagu	600,000 [1]
Do.	West Africa Portland Cement Co. Plc	Shagamu	600,000
Do.	Cement Co. of Northern Nigeria	Sokoto	500,000
Do.	Edo Cement Co. Ltd.	Okpella	450,000 [2]
Coal	Nigerian Coal Corp.	Enugu	150,000
Columbium (niobium) and tantalum	Artisanal	Jos region	70
Copper, secondary	Sun & Sand Industries Ltd.	Ota	NA
Iron and steel:			
Iron ore	National Iron Mining Co. Ltd.	Itakpe	5,500
Steel:			
Steel, crude	Ajaokuta Steel Co. Ltd.	Blast furnace at Ajaokuta	1,350,000 [2]
Do.	Delta Steel Co. Ltd.	Electric arc furnaces at Aladja	1,000,000 [2]
Do.	African Steel Mills Ltd.	Electric arc furnace at Ikorodu	NA
Rolling mills	Delta Steel Co. Ltd.	Aladja	300,000 [2]
Do.	Jos Steel Rolling Co. Ltd.	Jos rolling mill	210,000 [1]
Do.	Katsina Steel Rolling Co. Ltd.	Katsina rolling mill	210,000 [1]
Do.	Oshogbo Steel Rolling Co. Ltd.	Oshogbo rolling mill	210,000 [1]
Do.	Ajaokuta Steel Co. Ltd.	Ajaokuta	130,000
Do.	African Steel Mills Ltd.	Rolling mill at Ikorodu	100,000
Do.	Sunflag Steel (Nigeria) Ltd.	Rolling mill at Lagos	30,000
Natural gas, liquefied	Nigeria Liquefied Natural Gas Ltd.	Finima, Bonny Island	8,900
Nitrogen, ammonia	National Fertilizer Co. of Nigeria Ltd.	Onne	365,000 [1]
Petroleum			
Crude million 42-gallon barrels	Various joint ventures with Nigerian National Petroleum Corp.	Niger Delta and offshore	910
Refined petroleum products do.	Port Harcourt Refining Co. Ltd.	Old Port Harcourt refinery	22
Do. do.	do.	New Port Harcourt refinery	55
Do. do.	Warri Refinery and Petrochemicals Co. Ltd.	Warri refinery	43
Do. do.	Kaduna Refinery and Petrochemicals Co. Ltd.	Kaduna refinery	38
Tin	Artisanal	Mines at Dutse Nkura	30
Do.	do.	Mines at Jos (Gurum)	30
Do.	Makeri Smelting Co. Ltd.	Refinery at Jos	1,000 [1]

NA Not available.
[1]Closed.
[2]Under rehabilitation.

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THE MINERAL INDUSTRY OF RWANDA

By Thomas R. Yager

Rwanda's mineral industry produced gold ores and concentrates of columbite and tantalite, tin, and tungsten, most of which was designated for export. This small country in central Africa also produced cement, sapphire, and small quantities of natural gas (table 1). Rwanda was also known to have deposits of beryllium, kaolin, and peat. In addition to its own production, Rwanda re-exported concentrates of columbite and tantalite, and tin produced in Congo (Kinshasa).

In 2004, Rwanda's gross domestic product (GDP) amounted to about $11.6 billion based on purchasing power parity. The GDP grew by 4% in 2004 after rising by 0.9% in 2003. In 2003, construction and public works accounted for 11% of the GDP; manufacturing, 9%; and mining and quarrying, less than 1% (International Monetary Fund, 2004, p. 80; 2005, p. 208; 2005§[1]).

In 2004, the value of production in the mining and quarrying sector rose by about 55%. From 1999 to 2004, mineral exports accounted for nearly 45% of the increase in Rwanda's total exports. The construction sector grew by 7.5% in 2004, and the manufacturing sector, by about 6%. Output in the electricity, gas, and water sector fell by 22% (Banque Nationale du Rwanda, 2005; Ministère des Finances et de la Planification Economique, 2005, p. 16).

Commodity Review

Metals

Columbium (Niobium) and Tantalum.—Coopérative de Promotion de l'Industrie Minière Artisanale (COPIMAR), Régie d'Exploitation et de Développement des Mines (REDEMI), and other companies produced ores of columbium (niobium) and tantalum. REDEMI operated processing facilities at Gatumba. In 2003, COPIMAR produced 89 metric tons (t) of columbite-tantalite concentrates; REDEMI, 9 t; and other companies, 20 t. In 2004, REDEMI planned to produce 30 t of columbite-tantalite; the state-owned company planned to put its first concessions up for sale in 2007 (Africa Mining Intelligence, 2004; Pourtier, 2004, p. 9).

In 2004, exports of columbite-tantalite concentrates were 861 t at a value of $13 million. Columbite-tantalite accounted for 13% of total exports in 2004 compared with 10% in 2003 and 21% in 2002 (Banque Nationale du Rwanda, 2005; Ministere des Finances et de la Planification Economique, 2005, p. 28).

Gold.—Artisanal miners produced small amounts of gold. Production fell after the Government outlawed mining in the Nyungwe Forest; mining reportedly contributed to environmental damage to the forest (Pourtier, 2004, p. 33).

Tin.—REDEMI operated a cassiterite-processing facility at Rutongo; the company planned to produce 547 t of cassiterite (tin ore) in 2004. In 2003, REDEMI produced 168 t of cassiterite; COPIMAR, 106 t; and other companies, 9 t. Rwanda's exports of cassiterite were 3,553 t at a value of about $15.9 million in 2004. Cassiterite accounted for 16% of total exports in 2004 compared with 7% in 2003 and 2% in 2002. Exports increased because of higher tin prices, which were attributable to rising Chinese consumption, an expansion of the consumer electronics sector, and the European Union's ban on lead solders in electronic devices (Africa Mining Intelligence, 2004; Pourtier, 2004, p. 9; Banque Nationale du Rwanda, 2005; Ministere des Finances et de la Planification Economique, 2005, p. 28).

The Metal Processing Association operated a cassiterite-processing facility and a tin smelter at Gisenyi. The smelter's outdated technology led to pollution and excessive consumption of electricity. In 2004, exports of refined tin were 71 t at a value of about $470,000, which was less than 1% of total exports (Pourtier, 2004, p. 18; Banque Nationale du Rwanda, 2005).

Tungsten.—REDEMI operated a wolframite-processing facility at Nyakabingo; the company planned to produce 234 t of wolframite (tungsten ore) in 2004. In 2003, REDEMI produced 66 t of wolframite; COPIMAR, 25 t; and other companies, 18 t. Exports of wolframite amounted to 156 t at a value of about $410,000 in 2004, or less than 1% of total exports (Africa Mining Intelligence, 2004; Pourtier, 2004, p. 9; Banque Nationale du Rwanda, 2005).

Industrial Minerals

Cement.—Cimenterie du Rwanda (Cimerwa) was Rwanda's only producer of cement; production was 104,205 t in 2004 compared with 104,613 t in 2003. In 2004, production was inhibited by power shortages. The growth in the construction sector and stagnation in Cimerwa's output contributed to higher imports of construction materials. The volume of cement imports rose by 7% in 2004, and of all construction materials, by 15%. Imports of construction materials amounted to $10.2 million, or 3% of total imports (Ministere des Finances et de la Planification Economique, 2005, p. 21, 31).

Mineral Fuels

Natural Gas.—Rwanda had resources of natural gas under Lake Kivu. Natural gas production was 314,000 cubic meters in 2003 compared with 103,000 cubic meters in 2002 and 1.35 million cubic meters in 1999 (table 1). In 2004, Dane Associates Ltd. was negotiating with the Government over the construction of a new power station that would use natural gas extracted from Lake Kivu. The plant was expected to have a capacity of 20 to 30 megawatts (MW) (Africa Energy Intelligence, 2004; International Monetary Fund, 2004, p. 87).

Petroleum.—Rwanda did not have production facilities for petroleum products; all petroleum demand was met through

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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imports. In 2004, imports of energy products and lubricants amounted to 120,140 t at a value of $68.6 million; energy imports accounted for 20% of Rwanda's total imports (Ministere des Finances et de la Planification Economique, 2005, p. 31).

Infrastructure

The state-owned utility Electrogaz was the only domestic producer of electricity. In 2004, Electrogaz produced 90.5 gigawatthours (GWh) compared with 116.1 GWh in 2003 and 127.3 GWh in 1999. Hydroelectric sources provided most of Rwanda's electricity. From 1999 to 2003, imports of electricity increased to 126.7 GWh from 69.9 GWh. In 2004, the value of electricity imports amounted to $10 million, or 3% of total imports (International Monetary Fund, 2004, p. 87; Ministere des Finances et de la Planification Economique, 2005, p. 21, 31).

In 2004, the Governments of Burundi, Congo (Kinshasa), and Rwanda discussed the rehabilitation of the Ruzizi I hydropower station in Burundi. Repairs to Ruzizi I would increase capacity to 39.6 MW from 28.2 MW and allow the plant to export power to Rwanda. The Governments also discussed the rehabilitation of Ruzizi II and the possible construction of Ruzizi III (Misser, 2004).

Rwanda's transportation network comprised about 12,000 kilometers (km) of roads, of which 1,000 km was paved. Lake Kivu was navigable by shallow-draft barges and native craft. Transportation costs in this land-locked country were among the highest in Africa.

Outlook

The International Monetary Fund (2005, p. 208) predicted that Rwanda's GDP would grow by 4% in 2005 and 4.3% in 2006. In 2005, strong growth is expected to continue in the construction sector because of public building projects and road development (Ministère des Finances et de la Planification Economique, 2005, p. 61-62). The outlook for the mineral industry depends on favorable world market conditions for columbium (niobium) and tantalum, gold, tin, and tungsten, and reduced civil strife and political risks in the Great Lakes region.

References Cited

Africa Energy Intelligence, 2004, Rwanda—Lahmeyer weighs methane option: Africa Energy Intelligence, no. 363, February 11-24, p. 6.

Africa Mining Intelligence, 2004, Rwanda—Rise in Redemi's production: Africa Mining Intelligence, no. 79, February 18-March 2, p. 2.

Banque Nationale du Rwanda, 2005, Structure des exportations annuelles de 1989-2000 (Structure of annual exports from 1989 to 2000): Kigali, Rwanda, Banque Nationale du Rwanda, 1 p.

International Monetary Fund, 2004, Rwanda—Selected issues and statistical appendix: Washington, DC, International Monetary Fund, December 3, 108 p.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Ministère des Finances et de la Planification Economique, 2005, Annual economic report 2004: Kigali, Rwanda, Ministere des Finances et de la Planification Economique, 71 p.

Misser, François, 2004, Energy projects may yet power a revival of Great Lakes co-operation: African Energy, no. 77, August, p. 7-8.

Pourtier, Roland, 2004, The mining economy in the Kivu and its regional implications: Paris, France, Initiative for Central Africa, 54 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Rwanda, World Economic Outlook Database, accessed May 2, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/ index.htm.

TABLE 1
RWANDA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004[e]
Cement		70,716	91,204	100,568	104,613 r	104,205 [3]
Columbium (niobium) and tantalum:						
Gross weight, ore and concentrate	kilograms	561,000	241,000	96,000	128,000 r	200,000
Nb content	do.	176,000	76,000 r	30,000 r	40,000 r	63,000
Ta content	do.	124,000 r	53,000 r	20,000 r	26,000 r	40,000
Gold, mine output, Au content	do.	10	10 e	10 e	2 r	--
Natural gas, gross	thousand cubic meters	1,373 r	828 r	103 r	314 r	320
Tin:						
Mine output, Sn content		276	169	197	192 r	300
Refined		--	--	25 e	70 e	71 [4]
Tungsten, mine output, W content		108	142	153	78 r	120

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.
[1]Includes data available through May 16, 2005.
[2]In addition to the commodities listed, sapphire and pozzolanic materials are also known to be produced, but information is inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]Exports.

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TABLE 2
RWANDA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004[1]

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Cimenterie du Rwanda	Plant at Cyangugu	115,000.
Columbium (niobium) and tantalum	Régie d'Exploitation et de Développement des Mines	Concentrator at Gatumba	20 Nb_2O_5 and Ta_2O_5 in concentrate.[e]
Gold	Artisanal miners	Mines in Nyungwe Forest	NA.
Sapphire	do.	Mines at Cyangugu	NA.
Tin	Régie d'Exploitation et de Développement des Mines	Concentrator at Rutongo	370 in concentrate.[e]
Do.	Metal Processing Association	Concentrator at Gisenyi	NA.
Do.	do.	Smelter at Gisnyi	200.
Tungsten	Régie d'Exploitation et de Développement des Mines	Concentrator at Nyakabingo	170 in concentrate.[e]

[e]Estimated. NA Not available.
[1]Abbreviations used for commodities in this table include the following: Nb_2O_5, columbium (niobium) oxide, and Ta_2O5, tantalum oxide.

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The Mineral Industry of Sierra Leone

By George J. Coakley

The Republic of Sierra Leone is a small coastal West African country bordered by Guinea and Liberia. Sierra Leone has an area of 71,620 square kilometers (km^2) and had an estimated population of approximately 6 million in 2004. Sierra Leone was a producer of cement, diamond, gypsum, and salt and was working on the reopening of significant bauxite and rutile mining operations that were shut down during the civil war (1991-2002), from which the country has been gradually rebounding. United Nations (UN) peacekeeping forces were scheduled to be withdrawn from Sierra Leone and to be redeployed to Liberia by early 2005.

The International Monetary Fund reported that broad-based economic recovery continued in 2004. The expansion of economic output by 7.5% was attributed to robust activity in several sectors, which included diamond production, following the lifting of UN Security Council sanctions on the trade of diamond from Sierra Leone in June 2003. Inflation peaked at 15% during 2004 but was being contained by yearend; it declined to 7.5% by February 2005. The gross domestic product (GDP) based on purchasing power parity was estimated to be $3.335 billion in 2004 and the GDP per capita based on purchasing power parity was $600. Merchandise trade exports increased to $171.8 million from $146.3 million during 2003. Diamond exports accounted for $158.3 million (92% of export trade) in 2004 and $126.2 million (86.3% of export trade) in 2003. The Government collected a 3% royalty on diamond exports. The decline in total merchandise imports to $122.3 million from $139.7 million in 2003 was attributed to the phased withdrawal of UN peacekeeping forces (International Monetary Fund, 2005a§,[1] b§; U.S. Central Intelligence Agency, 2005§).

Government Policies and Programs

Mining in Sierra Leone is regulated by the Mines and Minerals (Amendment) Act of 1994 and by the Mines and Minerals (Amendment) Act of 2003, which added specific penalties for diamond smuggling. The Petroleum Act of 2001 regulates petroleum activities. In October 2003, the Ministry of Mineral Resources formally announced a new "Core Mineral Policy" designed to revive the mining sector, which contributed more than 70% of the country's foreign exchange earnings, 20% of the GDP, and 15% of fiscal revenues during the 1960s and 1970s. It calls for the review of all mining laws and regulations to make them internationally competitive. Its aim is to have four or five large mechanized bauxite, diamond, gold, and rutile mines in operation by 2008; to reduce illegal diamond mining and smuggling; and to improve the social, environmental, and economic performance of artisanal and small-scale mining (Sierra Leone Ministry of Mineral Resources, 2005a§; b§).

The Ministry of Mineral Resources is responsible for administration, the issuance of licenses, field monitoring, and enforcement; records are maintained at the Ministry in Freetown and in local mining offices. The Mines and Minerals Act recognizes the following types of mineral licenses: nonexclusive prospecting, exclusive prospecting, exploration, and mining. Artisanal mining licenses can be issued only to a Sierra Leonean citizen. By 2004, 2,300 artisanal mining licenses and 80 prospecting and exploration licenses had been issued. In the case of diamond, all miners are required to obtain a license from the Director of Mines, as are dealers and exporters. A miner may legally sell stones only to a licensed dealer or exporter, and a dealer, only to an exporter. Monitoring is conducted through a field system of Mines Monitoring Officers and Mine Wardens. In 2004, the Government created a Precious Metals Monitoring Team that comprises eight police officers and eight Mines Monitoring Officers with the intent of curbing illicit mining activities. During 2004, responsibility for implementing Sierra Leone's participation in and compliance with the international diamond trade control requirements of the Kimberley Process Certification System (KPCS) was transferred from the Government Gold and Diamond Office of the Ministry of Mineral Resources to the Gold and Diamond Department of the National Revenue Authority. As part of the Government's effort to facilitate the new diamond valuation and export procedures, the Parliament enacted the Banking Act of 2000, and the Bank of Sierra Leone issued new regulations in 2001. In August 2004, the Parliament passed a new Investment Promotion Act designed to attract foreign investment and to promote value-added production of domestic resources (Sierra Leone Parliament, 2005§).

In an attempt to address the problem of outsider artisanal and small-scale miners gaining access to mining licenses of Chieftaincy lands, the Government created Chiefdom Mining Allocation Committees to screen potential mining license holders through an informal system before an artisanal diamond mining license application or a small-scale mining company's application is considered by the Ministry. In this way, the legitimacy of land claims that concern a proposed mining site can be examined and problems resolved at the community level. The Government has recognized the following chiefdoms with respect to diamond mining regions: Bo, Bombali, Bonthe, Kailahun, Kambia, Kenema, Koinadugu, Kono, Moyamba, Port Loko, Pujehun, and Tonkolili. Non-Sierra Leonean nationals wishing to take part in mining operations or marketing in these regions must relocate to one of these chiefdoms. The Paramount Chief is the chair of the committee, which consists of five members; the Government's mining engineer serves as technical advisor. The prospective lessee pays surface rent direct to the chiefdom (Sierra Leone Ministry of Mining and Minerals Resources, 2005a§).

The Ministry of Mining and Minerals Resources issues licenses for prospecting, exploration, and mining of diamond, and to dealers and exporters. Artisanal licenses may be issued for terms of up to 2 years, with possible yearly extensions only to diggers from Sierra Leone or to cooperatives registered under the Co-operatives Act Cap 253 and registered with the

[1]References that include a section mark (§) are found in the Internet References Cited section.

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Director of Mines "for approval to participate in artisanal mining of precious minerals." All financial supporters of artisanal miners must be registered with the Government's resident mining engineer. Artisanal miners and cooperatives of artisanal miners must pay a set annual fee per acre of Le200,000 ($74).[2]

The U.S. Agency for International Development, in cooperation with Global Witness, the United Kingdom Department for International Development (DFID), the DeBeers Group, and the Rapaport Group of New York, helped fund the Integrated Diamond Management & Policy (IDMP) program and the Peace Diamond Alliance (PDA) in Sierra Leone to organize artisanal diamond mining cooperatives and to implement policy reform in the diamond sector (Integrated Diamond Management & Policy Program, 2005§). The purpose of the PDA is to address inequities in artisanal mining at the local level from harsh, largely unregulated labor conditions, to control environmental degradation, and to improve implementation of the Kimberley Process in the artisanal mining sector through cooperation among Government, civil society, and business. The PDA was launched in December 2002 and was registered as a Sierra Leonean organization in 2004. It is currently based in the Kono District and the Tongo Fields and is expected to expand.

Commodity Review

Metals

Bauxite and Alumina.—Sierra Minerals Ltd. (a subsidiary of MIL Investments Sarl) was granted a mining license to reopen the Mokanji bauxite mine near Moyamba. The main Gbonge-Mokanji deposit was actively mined between 1963 and 1995. The company expected to produce 1.2 million metric tons per year (Mt/yr) of bauxite at grades of 55% aluminum and 4% silica after blending during a 10-year period; startup was expected sometime during 2005. A second bauxite deposit at Port Loko, which represented the northern extension of the Mokanji Belt, had estimated reserves of 100 million metric tons (Mt) at grades of 48% aluminum and 3% silica. Both deposits have access to favorable rail, road, and port infrastructure. Other deposits were known at Krim-Kpakan in the Pojehun District of southern Sierra Leone, along the Freetown Peninsula, and the Kamakwie and the Makumre deposits in northern Sierra Leone. The bauxite is formed from the tropical weathering of the aluminum-rich hypersthene/feldpsar rich rocks of the high-grade crystalline schists and gneisses of the Kasila Group (Sierra Leone Ministry of Mineral Resources, 2004§, 2005b§).

Gold.—In late 2003, Mano River Resources Inc. of the United Kingdom and its local subsidiary Golden Leo Resources Inc. signed a joint-venture agreement with Golden Star Resources Ltd. of the United States to conduct gold exploration within the Archean greenstone rocks at the Nimini, the Pampana, and the Sonfon properties. Golden Star could earn a 51% interest in the properties by spending $6 million during the following 4 years. A comprehensive soil geochemistry survey was conducted during 2004 (Mano River Resources, 2005§).

Other companies exploring for gold included Harry Winston Inc. through its subsidiary Baomahun Gold Mines Inc., which had exploration licenses at Boamahun and Victoria in the Kamgari Hills, and Golden Prospects plc of the United Kingdom on the Lake Sonfon diamond-gold project. Lake Sonfon was a 50-50 joint venture with Mano River Resources, in which Mano River Resources managed diamond exploration. Golden Star Resources was earning a 50% interest in the gold section of the joint venture and managed gold exploration (Golden Prospects plc., 2005).

Platinum-Group Metals.— Golden Prospects held a 50% interest in the York platinum exploration joint venture on the Freetown Peninsula of Sierra Leone with Jubilee Platinum plc, which was the manager and held the remaining 50% (Golden Prospects plc, 2005§).

Titanium and Zirconium.—Sierra Rutile Ltd. (SRL), which was owned by MIL Investments Sarl of Luxembourg (75%) and U.S. Titanium LLC (25%), planned to restart production of the titanium ores, ilmenite and rutile, from its mine near the Imperri Hills at a capital cost of nearly $70 million. In 2005, SRL will be incorporated into the Titanium Resources Group Ltd. of the United Kingdom, where it will seek additional capital on the Alternative Investment Market of the London Stock Exchange. The company had begun the maintenance and restoration of the mine site in January 2001; it was closed in 1995, which was midway through the prolonged 1991-99 civil war. In the first phase of the project, SRL planned to start producing at a rate of 110,000 metric tons per year (t/yr) of rutile and 20,000 t/yr of ilmenite by the first quarter of 2005 and to reach full operating capacity by yearend 2005. The company planned to increase rutile production to 200,000 t/yr in the second phase (OPIC News, 2003; Africa Mining Intelligence, 2004; Afrol News, 2005§). In March 2003, the U.S. Overseas Private Investment Corp. agreed to provide SRL with an investment guaranty of $25 million to restart and expand mining operations. The European Union provided an additional $25 million under the System for Stabilisation of Export Earnings for Mining Products. SRL also held an exploration license for ilmenite, rutile, and zircon at Rotifunk (OPIC News, 2003; Africa Mining Intelligence, 2004b). At the closure of Sierra Rutile operations in 1995, the remaining reserves were 150 Mt at a grade of 1.5% to 2% rutile at the Gbangbama Group deposits, 180 Mt at a grade of 1.2% to 1.6% rutile at the Sembehun Group deposits, and 235 Mt at a grade of 0.62% rutile at the Rotifunk deposit (Sierra Leone Ministry of Mineral Resources, 2005b§).

Industrial Minerals

Cement.—Sierra Leone Cement Corp. [Heidelberg Cement AG (50%)] operated a cement plant near Freetown that used clinker imported from Norway. Postwar reconstruction led to higher demand for building materials, especially cement. Between 2000 and 2004, cement production increased by 146% to its capacity level of 180,430 metric tons (t) in 2004. To meet demand in 2004, an additional 4,500 t of cement was imported (Bank of Sierra Leone, 2005§).

[2] Where necessary, values have been converted from Sierra Leone leones (Le) to U.S. dollars (US$) at the rate of Le2,700=US$1. 00 for 2004 and Le2,348=US$1.00 for 2003.

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Diamond.—From the 1935 formation of Sierra Leone Selection Trust (SLST) (a subsidiary of De Beers) through 2004, an estimated 14 million carats of diamond have been produced in Sierra Leone. The country is famous for its large high-value stones, which include the 969.8-carat Star of Sierra Leone discovered in 1972, 188- and 283-carat stones found in 1996, a 500-carat boart, and a 110-carat diamond found in 2002 (Mining Journal, 2003b). The majority of diamond production has come from alluvial mining, approximately 70% of which has been from the Kono area. The main diamond mining areas are in the Bo, the Kenema, and the Kono Districts along the drainages of the Bafi, the Mano, the Moa, the Sewa, and the Woa Rivers. Large gravel areas are still intact along these drainages but are buried too deep for normal artisanal exploitation. Diamond production peaked at 2 million carats per year in the late 1960s. In 1971, SLST was nationalized and renamed National Diamond Mining Co. De Beers retained a minority interest until 1984. Beginning in 1971, officially reported production and exports showed a steady decline and bottomed out at 9,300 carats by the end of the 8-year civil war in 1999 (figure 1).

Political and economic reviews of Sierra Leone between 1971 and 2001 highlighted the widespread political corruption and encouragement of illegal mining and smuggling of Sierra Leone's diamonds. In a 2000 report, the non-Governmental organization, Partnership Africa Canada, documented Belgian imports of 770,000 carats from Sierra Leone in 1998 and an average of more than 6 million carats per year from Liberia between 1994 and 1998 (Smillie, Gberie, and Hazleton, 2000§).

Liberian domestic artisanal diamond mining capacity was between 100,000 and 430,000 carats during this period with the difference being in Belgian diamond imports from Liberia, which were most likely attributed to the transiting of smuggled conflict diamond from Sierra Leone, Angola, and the Democratic Republic of the Congo. International efforts to stop such illegal mining and smuggling of diamond that fuels civil conflict led to the creation of the KPCS in November 2002. Sierra Leone, however, was one of the first countries to put in place a UN-approved certification system for the legal export of diamond in October 2000 (Associated Press, 2000§). Exports of diamond have risen dramatically since then from nearly 206,000 carats valued at $26 million in 2001 to 692,000 carats valued at close to $127 million in 2004 (table 2). Table 3 shows the distribution of 2004 production by artisanal and mechanized kimberlite mining.

Between 1999 and 2003, 54% of total diamond exports were industrial-grade stones, and 46%, gem quality. In 2004, nearly 89% of officially reported exports came from artisanal mining. A breakdown of artisanal exports by quality, size, and value is listed in table 4. Although the significant increase in official diamond exports in recent (2000-04) years suggest that the KPCS export controls appear to be working; the consensus of local Government officials, local companies, artisanal cooperatives, and diamond dealers, however, was that only 80% or less of production was being exported through official channels and that illegal diamond mining and smuggling had not yet been entirely halted.

On the basis of reports from the United Nations Mission in Sierra Leone (UNAMSIL) and the Ministry of Mineral Resources, between 560 and 660 significant mining operations, which represented 1,200 mining licenses, chiefly artisanal, were ongoing in Sierra Leone; during 2003, approximately 45% of them were operating legally, and about 50% of the mechanized operations were operating legally. Some of the dealers thought that the increasing Government fee for alluvial diamond mining licenses to $600 from $300 per claim was a disincentive for diggers to work within the system and was encouraging illegal mining.

Koidu Holdings SA was the sole active kimberlite mining operation in Sierra Leone. Koidu Holdings was a joint venture among Energem Resources Inc. (which changed its name from DiamondWorks Ltd. in 2004), 40%; Magma Diamond Resources, 35%; and the Benny Steinmetz Group (BSG Resources), 25%. Following the 1999 coup, the company resumed bulk sampling operations in June 2002 by using a 50-metric-ton-per-hour heavy-medium separation plant, commissioned its main plant in November 2003, and began formal production in January 2004 from two open pits. The $25 million development employed 330 people and operated three shifts, 7 days per week. Between January 2003 and February 2004, the company produced 87,000 carats from two pipes with an average stone size of 0.31 carat. In 2004, Koidu Holdings exported a total of 85,110 carats of diamond at an average value of $177.11 per carat. Capacity of the operation was 120,000 carats per year. Pipe 1 diamond has averaged $223 per carat, and Pipe 2, $183 per carat. The company was preparing to use a vertical pit mining method for Pipe 1 and expected to restart mining by the second quarter of 2005.

An assessment of reserves and resources by Venmyn Rand (Pty) Ltd., which is a South African consulting firm, confirmed the viability of continued mining of Pipes 1 and 2. The higher grade Pipe 1 will be mined at a rate of 20,000 metric tons per month (t/mo) of ore by open pit down to 200 meters (m) and then by sublevel open stoping for an additional 100 m underground. Pipe 2 will be mined by open pit down to 296 m at a rate of 25,000 t/mo. Venmyn estimated probable reserves for Pipe 1 to be 163,000 t at a recovered grade of 0.55 carat per ton at an average value of $230 per carat and for Pipe 2 at 461,000 t at a recovered grade of 0.26 carat per metric ton at an average value of $180 per carat. Total indicated resources for Pipes 1 and 2 and Dyke A were estimated to be 1.43 Mt at a recovered grade of 0.47 carat per ton at an average value of $189 per carat. Total inferred resources were estimated to be 3.545 Mt at a recovered grade of 0.35 carat per ton at an average value of $204 per carat, which gave a total indicated and inferred resources value of approximately $378 million. During 2004, Koidu Holdings won the Government tender to take over the rights to the Tongo area exploration licenses after Rex Mining defaulted on its obligations. The Tongo area contains an estimated diamond resource of 3.6 million carats (Energem Resources Inc, 2005§; Even-Zohar, 2004§; Sierra Leone Ministry of Mineral Resources, 2005b§).

In 2005, 19 companies were exploring for kimberlite and alluvial diamond. One such company was the joint venture of Crown Diamonds Ltd. (51%) and Mano River Resources (49%), which expected to begin production from its Lion Dykes underground mine. The operation expected to recover 1 carat per ton of ore mined at an anticipated value of $200 per carat. The joint venture was also exploring a number of other kimberlite dykes and

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pipes in the Kono area (Mano River Resources Inc., 2004§). Other active companies included Sierra Leone Diamond Co. Ltd. (formerly Africa Diamond Holdings Ltd.) of the United Kingdom, which had large holdings in the Bo area, along the Sewa River, and in the northeastern and northwestern quadrants of Sierra Leone and conducted a high resolution airborne magnetic survey of its concession. Sierra Diamond Ltd. (a subsidiary of Mano River Resources) was exploring for diamond in the Yengema and the N'Jaiama areas, and Africa Gold and Diamond Co., in the Sando Chieftaincy near Kono. Olympus Development Co. held the license on the Panguma dykes near Tongo; Gondwana (Investments) SA located one kimberlite site in the southeast and held six other licenses in the central and northwestern parts of Sierra Leone; and Cream Minerals Ltd. of Canada held an alluvial mining prospecting license along the Sewa River northeast of Sambuva and an offshore concession that drains the mouths of the diamond-bearing Moa and Mano Rivers.

Mineral Fuels

Petroleum.—In 2004, Sierra Leone did not produce or refine petroleum and was dependent upon imports for its petroleum requirements. Imports of petroleum products amounted to $87.12 million, or nearly 33% of total imports. Through an international tender, the Government awarded three offshore concessions for petroleum exploration in 2003. Repsol YPF SA of Spain acquired offshore exploration Blocks SL-6 and SL-7; Oranto Petroleum Ltd. of Nigeria, Block 5; and 8 Investments Inc. of the United States, Block 4. Each block covered 4,000 km^2 (Oil & Gas Journal, 2003; International Monetary Fund, 2005b§).

Infrastructure

Infrastructure was gradually being rebuilt following the war, but it remained fairly limited. The major international airport and harbor were located in the capital of Freetown. There were two other harbors at Pepel and Sherbro Islands and about 10 inland airstrips, most of which were unpaved. Only 8% of the country's network of 11,300 kilometers of roads was paved. Production of electricity by the National Power Authority decreased by 22.5% to 84.82 gigawatts per hour (Gw/hr) during 2004 owing to frequent breakdown of the electrical generating plants. Industrial consumption decreased by 16.5% to 4.59 Gw/hr. In May 2004, Sierra Leone signed an agreement with the Italian Government for a grant of €18 million ($21.6 million) to complete construction of the Bumbuna Hydroelectric Project by 2006. The Bumbuna Project will generate about 50 megawatts (MW) of electricity at the completion of Phase I and 150 MW at the completion of Phase II (Bank of Sierra Leone, 2005§).

References Cited

Africa Mining Intelligence, 2004, Sierra Leone—SRL to market rutile next year: Africa Mining Intelligence, no. 78, February 4-17, p. 1.

Mining Journal, 2003, Sierra Leone supplement—Mining and the Economy—Resource potential: Mining Journal, v. 340, no. 8722, February 7, p. 4-7.

Oil & Gas Journal, 2003, Exploration & development—Sierra Leone: Oil & Gas Journal, v. 101, no. 48, December 15, p. 37.

OPIC News, 2003, West Africa in focus—OPIC loan helps to restart mine in Sierra Leone—Four airports in Nigeria get computer centers: OPIC News, v. 5, no. 3, April, p. 3.

Internet References Cited

Afrol News, 2005 (April 6), Sierra Leone's rich rutile mines reopened, accessed November 2, 2005, at URL http://www.afrol.com/articles/16084.

Associated Press, 2000 (August 9), Sierra Leone diamond certification wins UN approval, accessed November 2, 2005, at URL http://www.globalpolicy.org/security/issues/diamond/slplan2.htm.

Bank of Sierra Leone, 2005, Annual report 2004, accessed November 1, 2005, at URL http://www.bankofsierraleone-centralbank.org/pdf/Annual_report_04.pdf.

Energem Resources Inc, 2005 (June 10), Annual Information Form for the year ended November 30, 2004, accessed November 2, 2005, at URL http://www.sedar.com/csfsprod/data58/filings/00800573/00000001/i%3A%5Ckkbl%5Csedar%5C41024%5C46%5C2004%5CAIF2004.PDF.

Even-Zohar, Chaim, 2004 (April 18), Sierra Leone passes major diamond good governance test, accessed November 2, 2005, at URL http://www.tacyltd.com/TenLiner_Full.asp?id=63.

Golden Prospects plc. 2005, Investment—Core—Exploration, accessed November 2, 2005, at URL http://www.goldenprospectplc.com/investment/exploration.

Integrated Diamond Management & Policy program, 2005, Integrated Diamond Management & Policy (IDMP) Program and Peace Diamond Alliance, accessed October 30, 2005, at URL http://www.peacediamonds.org/home.asp?id=02.

International Monetary Fund, 2005a (June 10), Sierra Leone—Ex post assessment of longer-term program engagement, Country Report No. 05/192, accessed October 22, 2005, at URL http://www.imf.org/external/pubs/cat/longres.cfm?sk=18314.0.s.

International Monetary Fund, 2005b (June 10), Sierra Leone—Sixth review under the poverty reduction and growth facility, requests for waiver of performance criteria and additional interim assistance under the enhanced initiative for heavily indebted poor countries, review of financing assurances, and ex post assessment of longer-term program engagement—staff report; staff statement; press release on the executive board discussion; and statement by the Executive Director for Sierra Leone, Country Report No. 05/194, accessed October 22, 2005, at URL http://www.imf.org/external/pubs/cat/longres.cfm?sk=18316.0.

Mano River Resources Inc., 2004 (December 1), Mano River and Crown Diamonds conclude a Heads of Agreement for kimberlite diamond production in Sierra Leone, Press Release, accessed November 1, 2005, at URL http://www.manoriver.com/i/pdf/news/nr0417_01dec.pdf.

Mano River Resources Inc., 2005, Projects—Gold—Sierra Leone—Overview, accessed, November 1, 2005, at http://www.manoriver.com/s/SL_Overview.asp.

Sierra Leone Ministry of Mineral Resources, 2004, Sierra Leone minerals sector overview, prepared for Indaba 2004, accessed October 30, 2005, at URL http://www.mmr-sl.org/4_1rep.htm.

Sierra Leone Ministry of Mineral Resources, 2005a, Mineral resources acts, accessed October 30, 2005, at URL http://www.mmr-sl.org/1_1acts.htm.

Sierra Leone Ministry of Mineral Resources, 2005b, Sierra Leone minerals sector overview—Prepared for Indaba 2005, Mineral Resources Acts, Sierra Leone National Encyclopedia 2005, accessed October 30, 2005, at URL http://www.daco-sl.org/encyclopedia/5_gov/5_2mmr.htm.

Sierra Leone Parliament, 2005, The Investment Promotion Act of 2004, accessed October 30, 2005, at URL http://www.sierra-leone.org/Laws/investmentpromotionact2004.pdf.

Smillie, Ian, Gberie, Lansana, and Hazleton, Ralph, 2000 (January), The heart of the matter—Sierra Leone, diamonds and human security, Published by Partnership Africa Canada, accessed November 2, 2005, at URL http://pacweb.org/e/index.php?option=content&task=view&id=42&Itemid=65#series.

U.S. Central Intelligence Agency, 2005, Botswana, World Factbook 2005, accessed October 30, 2005, at URL http://www.odci.gov/cia/publications/factbook/geos/sl.html#top.

Major Sources of Information

Deen, M.S. (Minister), 2004 (September 16-17), Sierra Leone Ministry of Mineral Resources, Presentation to DEPAC, *in* Sierra Leone National Encyclopedia—2005, available online at URL www.daco-sl.org/encyclopedia/6_lib/6_4/9_1_DEPAC_MMRpresentation.ppt.

Digitized by Google

Industrial Mining Rights in Sierra Leone, Map Prepared by SLIS, October 2004, *in* Sierra Leone National Encyclopedia—2005, available online at URL http://www.daco-sl.org/encyclopedia/2_data/ 2_3/2_3a/2_3a_10m/code0001b_A1.pdf.
Sierra Leone Mines Map Phase III, Map Prepared by UNAMSIL GIS, October 2003, *in* Sierra Leone National Encyclopedia—2005, available online at URL http://www.daco-sl.org/encyclopedia/2_data/2_3a10m.htm.
Sierra Leone Parliament, 2004, The Investment Promotion Act of 2004, available online at URL http://www.sierra-leone.org/Laws/investmentpromotionact2004.pdf.
Ministry of Mineral Resources, Ministry of Mineral Resources, *in* Sierra Leone National Encyclopedia—2005, available online at URL http://www.daco-sl.org/encyclopedia/5_gov/5_2mmr.htm.
Partnership Africa Canada, 2005 (February), Diamond industry annual review—Sierra Leone 2005, available online URL http://www.pacweb.org/e/images/stories/documents/sierraleoneannualreview05_adobe4.pdf.

Other Sources of Information

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TABLE 1
SIERRA LEONE: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		2000	2001	2002	2003[e]	2004[e]
Cement	metric tons	73,396	113,268	144,145	169,109 [2]	180,430 [2]
Diamond[3]	carats	77,372	222,520	351,860	506,819 [2]	691,757 [2]
Gold[e]	kilograms	--	--	--	--	1,000
Gypsum[e]	metric tons	4,000	4,000	4,000	4,000	4,000
Salt	do.	3,289 [r]	2,889 [r]	1,821 [r]	1,005 [2]	827 [2]

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. --Zero.
[1]Table includes data available through October 30, 2005.
[2]Reported figure.
[3]Exports.

Sources: Bank of Sierra Leone, 2004 Annual Report and Statement of Accounts, Salt and Cement Data, accessible online at URL http://www.bankofsierraleone-centralbank.org/pdf/Annual _report _04.pdf; Sierra Leone Ministry of Minerals Resources.

TABLE 2
SIERRA LEONE: DIAMOND EXPORTS, 2001-04

Year	Exports (carats)	Value of exports (in dollars)	Average price (dollars per carat)
2001	205,850	$26,022	$117
2002	351,859	41,732	119
2003	506,723	75,970	150
2004	691,757	126,653	183
Total	1,756,190	270,377	154

Source: Sierra Leone Ministry of Mineral Resources, Gold and Diamond Department.

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TABLE 3
SIERRA LEONE: DIAMOND EXPORTS BY SOURCE, 2004

Mining source	Exports (carats)	Value of exports (in dollars)	Average price (dollars per carat)
Artisanal	613,299	$112,793	$184
Kimberlite	78,459	13,860	177
Total	691,757	126,653	183

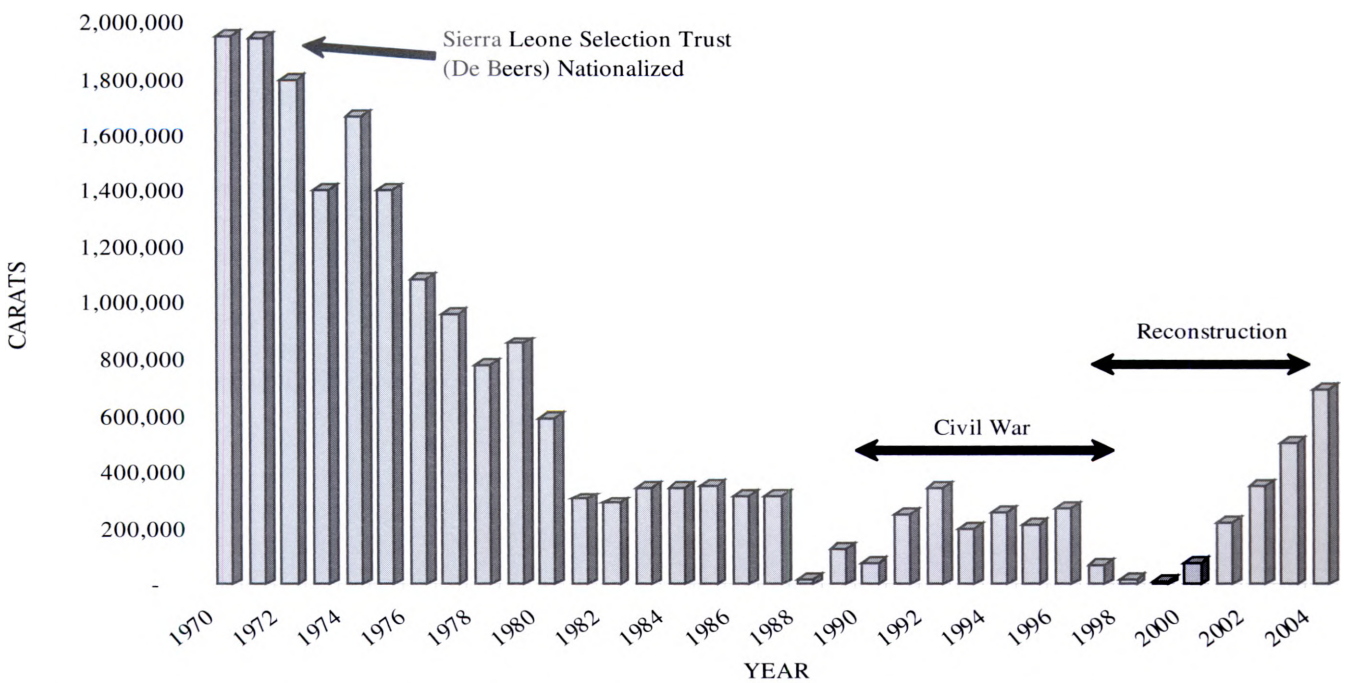
Source: Sierra Leone Ministry of Mineral Resources, Gold and Diamond Department.

TABLE 4
SIERRA LEONE: ANALYSIS OF ARTISANAL DIAMOND EXPORTS IN 2004

	Exports (carats)	Average price (dollars per carat)	Percent by weight	Percent by value
Industrials	303,909	$35	50%	9%
Gem, specials	4,940	2,224	1	10
Gem, plus 3 carats	34,209	1,122	6	34
Gem, small to 8 grains	270,241	196	44	47
Total/Average	613,299	184	100	100

Source: Sierra Leone Ministry of Mineral Resources, Gold and Diamond Department.

FIGURE 1
SIERRA LEONE DIAMOND EXPORTS, 1970-2004



Source: Sierra Leone Ministry of Mineral Resources, Gold and Diamond Department.

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The Mineral Industry of Somalia

By Thomas R. Yager

Somalia is an East African country located on the Gulf of Aden and the Indian Ocean that produced small quantities of gemstones, gypsum, salt, and sepiolite (meerschaum) in 2004. The country also had deposits of feldspar, iron ore, kaolin, limestone, natural gas, quartz, silica sand, tantalum, tin, and uranium. The mineral industry made a small contribution to Somalia's exports and to the economy in general.

Officially reported mineral and trade data continued to be unavailable because of the lack of a functioning central Government since 1991 and the conflict that pervaded most of Somalia. Somaliland (a region in northern Somalia) declared its independence in 1991, and Puntland (which was to the east of Somaliland) declared autonomy in 1998 (United Nations Integrated Regional Information Networks, 2004a). Neither of the declarations of independence were internationally recognized. Somalia's civil war has had considerable adverse consequences for the economy, which included the minerals sector. The war forced the closure of Somalia's cement plant and oil refinery, and halted most exploration for mineral resources.

In February 2004, the Transitional National Assembly endorsed an agreement between the Transitional National Government and various political factions regarding the selection of a future interim parliament. Signatories included the Rahanwayn Resistance Army, which had declared independence from Somalia in 2002. Sporadic conflict continued in some areas in Somalia in 2004, including Bulo Hawa and Mogadishu in May and Kismayo in September. Puntland and Somaliland were in conflict in the disputed Sool region (United Nations Integrated Regional Information Networks, 2004a-d).

Such gemstones as aquamarine, emerald, garnet, opal, red spinel, ruby, sapphire, and tourmaline were produced in Somaliland. Mining of Somaliland's gemstones was limited by civil strife, damaged infrastructure, and a lack of modern equipment. Garnet and opal accounted for the largest shares of gemstone production.

Since the closure of Somalia's oil refinery in 1991, all the country's demand for petroleum products has been met through imports. The energy sector also faced the problem of deforestation. Charcoal was the primary domestic source of energy and one of the country's leading exports. Somalia's installed electricity-generating capacity amounted to 70 megawatts, all of which was diesel fired. Ente Nazionale Energia Elettrica of Italy was responsible for the generation, transmission, and distribution of electricity (U.S. Energy Information Administration, 2003§[1]).

The transportation network comprised about 22,000 kilometers (km) of roads, of which 2,600 km was paved. Oil pipelines totaled 15 km. Ports and harbors were Bender Cassim (Boosaaso), Berbera, Chisimayu (Kismayo), Merca, and Mogadishu.

The outlook for Somalia's mineral industry is for little change in the short run. Barriers to development included continuing civil unrest, weak infrastructure, and a domestic market limited by severe poverty.

References Cited

United Nations Integrated Regional Information Networks, 2004a, Somalia—Calm in the south after factional violence near Kismayo: United Nations Integrated Regional Information Networks press release, September 21, 1 p.

United Nations Integrated Regional Information Networks, 2004b, Somalia—Clashes reported in disputed Sool region: United Nations Integrated Regional Information Networks press release, September 23, 2 p.

United Nations Integrated Regional Information Networks, 2004c, Somalia—Nearly 60 killed, thousands displaced in Bulo Hawa clashes: United Nations Integrated Regional Information Networks press release, June 3, 2 p.

United Nations Integrated Regional Information Networks, 2004d, Somalia—TNG endorses agreement: United Nations Integrated Regional Information Networks press release, February 9, 1 p.

Internet Reference Cited

U.S. Energy Information Administration, 2003 (August), Horn of Africa, Country Analysis Brief, accessed April 20, 2004, at URL http://www.eia.doe.gov/emeu/cabs/hornafrica.html.

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[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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TABLE 1
SOMALIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]	2000	2001	2002	2003	2004
Gypsum	1,500	1,500	1,500	1,500	1,500
Salt, marine	1,000	1,000	1,000	1,000	1,000
Sepiolite, meerschaum	6	6	6	6	6

[1]Estimated data are rounded to no more than three significant digits.
[2]Table includes data available through March 28, 2005.
[3]In addition to the commodities listed, precious and semiprecious gemstones were reportedly produced, and various crude construction materials (for example, clays, sand and gravel, crushed and dimension stone) and lime are presumably produced, but information is inadequate to estimate output.

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The Mineral Industry of South Africa

By Thomas R. Yager

The Republic of South Africa was one of the world's leading mining and mineral-processing countries. South Africa was the world's leading producer of andalusite, chromite, ferrochrome, gold, platinum-group metals (PGM), vanadium, and vermiculite, and the world's fifth ranked producer of rough diamond (Kweyama, 2005; Northwest Territories Department of Industry, Tourism and Investment, 2005, p. 6, 9; Amey, 2006; George, 2006; Papp, 2006, p. 17.22-17.23; Potter, 2006; Willett and Potter, 2006).

In 2004, South Africa's nominal gross domestic product (GDP) at purchasing power parity amounted to about $502 billion; the per capita GDP was about $10,800. The real GDP grew by 3.7% compared with 2.8% in 2003. The mining industry accounted for 7.1% of the GDP in 2004; primary and processed mineral products accounted for more than 35% of total exports. About 72% of primary mineral products and 75% of processed mineral products, by value, were exported in 2004 (International Monetary Fund, 2005, p. 212; 2005§[1]; Mwape and others, 2005, p. 8-9, 14, 17).

Commodity Review

Metals

Aluminum.—South Africa produced primary refined aluminum from imported alumina. National aluminum production increased to 863,000 metric tons (t) in 2004 from 738,000 t in 2003. BHP Billiton plc operated the Bayside and the Hillside primary aluminum smelters at Richards Bay. In 2004, production at the Hillside smelter increased to 680,000 t from 551,000 t in 2003 because of an expansion completed in December 2003. Production at the Bayside smelter declined to 183,000 t from 187,000 t (BHP Billiton Group, 2004, p. 2; 2005, p. 2).

Chromium.—In 2004, South Africa accounted for nearly 44% of the world's chromite production. National output of chromite increased to 7.68 million metric tons (Mt) in 2004 from 7.41 Mt in 2003. In 2004, South Africa's exports of chromite amounted to $45.2 million (Mining Journal, 2005; Papp, 2006, p. 17.22).

Xstrata plc of Switzerland and its joint-venture partners operated the Boshoek, the Chrome Eden, the Horizon, the Kroondal, the Thorncliffe, and the Waterval Mines, which had a total capacity of 6.19 million metric tons per year (Mt/yr) of chromite. At the Kroondal Mines, production increased to 2.13 Mt in 2004 from nearly 1.93 Mt in 2003; at the Thorncliffe Mines, to nearly 1.49 Mt from 1.34 Mt; and at the Waterval Mine, to 405,000 t from 46,000 t. Output at the Boshoek Mine was 253,000 t in 2004; the Horizon Mine, 123,000 t; and the Chrome Eden Mine, 23,000 t (Xstrata plc, 2005, p. 176).

Samancor Ltd. [a joint venture between BHP Billiton Group (60%) and Anglo American plc (40%)] operated the Eastern Chrome Mines in Mpumalanga Province with a capacity of 2 Mt/yr of chromite and the Western Chrome Mines in North West Province with a capacity of about 1.8 Mt/yr. In 2004, Samancor's production increased by 2.4%. About 75% of the company's output was consumed in its ferrochromium plants and the remainder was exported (Department of Minerals and Energy, 2004, p. 3, 5; Anglo American plc, 2005, p. 118; Samancor Ltd., undated§).

Assmang Ltd. of South Africa operated the Dwarsrivier Mine in Mpumalanga. In financial year 2003-04, production at Dwarsrivier increased to 648,000 t from 604,000 t in financial year 2002-03. Resources at Dwarsrivier amounted to 86.6 Mt at a grade of 38.7% Cr_2O_3, of which 27.1 Mt was reserves at a grade of 38.5% Cr_2O_3 (Assmang Ltd., 2004a, p. 12; 2004b).

Assmang planned to complete construction of an underground mine at Dwarsrivier to replace the open pit mine in 2005; total production of chromite was expected to be nearly 1 Mt. By 2007, the underground mine was expected to completely replace the open pit mine. By 2009, production was expected to exceed 1 Mt (Assmang Ltd., 2004b; Motsepe, 2005, p. 32).

South Africa was also the world's leading producer of ferrochromium, and accounted for 46% of world production in 2004. National production of ferrochromium rose to nearly 2.97 Mt in 2004 from 2.81 Mt in 2003 (Papp, 2006, p. 17.23).

Xstrata and its joint-venture partner Merafe Resources Ltd. of South Africa (formerly SA Chrome Ltd.) operated the Boshoek, the Gemini, the Lydenburg, the Rustenburg, and the Wonderkop ferrochromium plants. These plants had a total combined capacity of 1.62 Mt/yr. Production increased at Rustenburg to 393,000 t in 2004 from 322,000 t in 2003; at Lydenburg, to 393,000 t from 385,000 t; and at Gemini, to 173,000 t from 156,000 t. At Wonderkop, output declined to 311,000 t from 318,000 t. The Boshoek plant produced 218,000 t in 2004. In 2005, the total production of these plants was expected to increase to 1.59 Mt (Mining Journal, 2005; Xstrata plc, 2005, p. 176).

In December 2004, Xstrata and Merafe started construction on Project Lion, which was a new ferrochromium smelter with a capacity of 360,000 metric tons per year (t/yr). The project was expected to cost $264 million; Xstrata planned to start production in mid-2006 and reach full capacity in the fourth quarter of 2007. During the next 8 to 10 years, capacity could be increased by an additional 650,000 t/yr. Xstrata's share in the Lion Project was expected to be between 75% and 85% (Mining Journal, 2005; Xstrata plc, 2005, p. 8, 35).

Samancor operated the Ferrometals plant in Witbank, the Middleburg Ferrochrome plant in Middleburg, and the Tubatse Ferrochrome Plant in Steelpoort, which had a total capacity of 905,000 t/yr. In 2004, the company's production of ferrochrome rose to nearly 1.07 Mt from 1.02 Mt in 2003 (BHP Billiton Group, 2004, p. 4; 2005, p. 4; Department of Minerals and Energy, 2004, p. 21-22).

[1]References that include a section mark (§) are found in the Internet References Cited section.

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Assmang operated the Machadodorp ferrochromium plant in the Mpumalanga Province. In financial year 2003-04, production increased to 263,000 t from 222,000 t in financial year 2002-03 (Assmang Ltd., 2004b).

Copper.—In 2004, South Africa's mine production of copper decreased to 102,577 t from 120,800 t in 2003. Copper smelter production declined to 89,300 t from 112,025 t, and refined copper production declined to 91,498 t from 111,000 t. Copper exports amounted to $75.1 million in 2004 (Mining Journal, 2005).

Rio Tinto plc operated the Palabora copper mine, smelter, and refinery. In 2004, production at Palabora was 54,400 t of copper from 8.67 Mt of ore milled compared with 52,400 t of copper from 11.42 Mt of ore milled in 2003. The production of smelted copper at Palabora declined to 67,200 t in 2004 from 76,700 t in 2003, and the production of refined copper, to 67,500 t from 73,400 t (Rio Tinto plc, 2005, p. 19).

Anglo Platinum's production of refined copper from Rustenburg Base Metal Refiners remained unchanged at 12,900 t in 2004. About 12,200 t was attributable to Anglo Platinum's mining operations in 2004 compared with 12,800 t in 2003; the remainder was attributable to purchased concentrates (Anglo American Platinum Corp., 2005, p. 86, 88).

Metorex Ltd. of South Africa operated the Maranda copper-zinc mine and the O'okiep copper smelter. In the third quarter of 2004, Metorex shut down Maranda and O'okiep because of resource depletion (Metorex Ltd., 2004).

Gold.—South Africa was the world's leading producer of gold in 2004, accounting for about 14% of world production. However, the long-term decline in the country's gold output continued in 2004, with national gold production decreasing to 340,500 kilograms (kg) from 373,300 kg in 2003 and 430,800 kg in 2000. In 2004, gold exports amounted to $4.49 billion (Amey, 2006; Mining Journal, 2005).

AngloGold Ashanti Ltd. operated the Ergo Mine southeast of Johannesburg; the Great Noligwa, the Kopanang, the Moab Khotsong, and the Tau Lekoa Mines in the West Wits area near Carletonville; and the Mponeng, the Savuka, and the Tau Tona Mines in the Vaal River area near Klerksdorp. The company was formed by the merger of AngloGold Ltd. and Ashanti Goldfields Company Ltd. in 2004. AngloGold Ashanti's gold production declined to 95,800 kg in 2004 from 102,100 kg in 2003. Total cash costs rose to $291 per troy ounce of gold from $227 per troy ounce of gold; this increase was mostly attributable to the strength of the South African rand and inflationary pressures (AngloGold Ashanti Ltd., 2005, p. 23-24).

At the Mponeng Mine, production declined to 13,600 kg in 2004 from 15,500 kg in 2003 because of lower ore grades. At the Tau Tona Mine, lower ore grades and difficult mining conditions led to a decrease in production to 17,700 kg from 20,100 kg. Output declined to 4,900 kg from 5,800 kg at Savuka as the mine approached the end of its life. Cash costs at Savuka were $455 per troy ounce of gold in 2004. In 2005, production at the Mponeng Mine was expected to increase to 14,600 kg. Production at the Tau Tona and the Savuka Mines was likely to be 17,700 kg and 5,000 kg, respectively (AngloGold Ashanti Ltd., 2005, p. 24-25).

In 2004, production at the Great Noligwa Mine declined to 24,700 kg from 25,300 kg in 2003, and at the Tau Lekoa Mine, to 9,100 kg from 10,000 kg, because of lower ore grades. At the Kopanang Mine, output declined to 15,100 kg from 15,500 kg because of lower volumes mined. In 2005, production at Great Noligwa was expected to be 24,300 kg; Kopanang, 14,600 kg; and Tau Lekoa, 9,700 kg (AngloGold Ashanti Ltd., 2005, p. 26-29).

The Moab Khotsong Mine produced nearly 300 kg of gold in 2004. AngloGold Ashanti planned to start commercial production at Moab Khotsong in 2006 and to increase output to 15,600 kg by 2010. The mine was expected to produce 152,000 kg of gold from 7.75 Mt of milled ore during its 12-year life; capital costs were likely to be $651 million (AngloGold Ashanti Ltd., 2005, p. 28-29).

At Ergo, gold was recovered through the re-treatment of tailings. Gold production increased to 6,900 kg in 2004 from 6,300 kg in 2003 because of higher grades treated. Ergo was expected to shut down in 2005, however, because of the depletion of higher-grade content at the tailings dam (AngloGold Ashanti Ltd., 2005, p. 29).

Harmony Gold Mining Company Ltd. of South Africa mined gold at numerous mines that included the Elandsrand, the Evander, the Kalgold, the Orkney/Welkom, and the Randfontein. The company's production of gold was 89,598 kg in 2004 compared with 90,187 kg in 2003. The decrease in ore milled was mostly offset by an increase in grade to 4.48 grams per metric ton (g/t) gold in the fourth quarter of 2004 from 3.83 g/t gold in the same period in 2003 (Harmony Gold Mining Company Ltd., 2003, p. 25; 2004a, p. 24; 2004b, p. 31; 2005, p. 32).

In 2004, Harmony purchased a controlling share in the Target Mine from Avgold Ltd. The company planned to produce more than 18,000 kilograms per year (kg/yr) from the Target Mine. The Phakisa shaft project was expected to produce 8,700 kg/yr of gold. At the Tshepong Sub 66 Decline expansion project, gold production was expected to be 5,200 kg/yr starting in July 2006. The Masimong project produced gold at the rate of 7,800 kg/yr in the second half of 2003; Harmony planned to raise output to 9,800 kg/yr (Mining Review Africa, 2004a).

Gold Fields Ltd. of South Africa produced gold at the Beatrix, the Driefontein, and the Kloof Mines. In 2004, the company's production of gold was 87,744 kg from 16.4 Mt of ore milled compared with 89,860 kg of gold from 16.7 Mt of ore milled in 2003. In the second half of 2004, the ore grade was 5.6 g/t gold compared with 5.2 g/t gold in the second half of 2003. Production at the Driefontein Mine increased to 35,804 kg in 2004 from 35,607 kg in 2003. At the Kloof Mine, production declined to 32,884 kg from 33,754 kg, and at the Beatrix Mine, to 19,054 kg from 20,499 kg. Gold Fields planned to maintain production at Driefontein of 31,000 kg/yr; Kloof, 31,000 kg/yr, and Beatrix, nearly 19,000 kg/yr. At these rates of production, the life of the Kloof Mine was estimated to be 10 years; Driefontein, 8 years; and Beatrix, 5 years (Gold Fields Ltd., 2003, p. 11; 2004a, p. 13; 2004b, p. 13; 2005, p. 2, 13).

In 2004, gold production by Durban Roodepoort Deep Ltd. of South Africa declined to 23,170 kg from 26,465 kg in 2003. Output at the North West Mines declined to 9,993 kg

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from 11,820 kg, and at the Blyvooruitzicht Mine, to 5,866 kg from 7,672 kg. The decrease in production was attributable to mechanical problems and the reduction of unprofitable underground mining operations. In the second quarter of 2004, cash operating costs at Blyvooruitzicht's underground operations were $488 per troy ounce of gold compared with $324 per troy ounce of gold in the same period in 2003. Production at the Crown and ERPM joint ventures increased to 7,311 kg in 2004 from 6,973 kg in 2003. The life of East Rand Proprietary Mines (ERPM) was expected to be 8 years (Durban Roodepoort Deep Ltd., 2003, 2004a, b; 2005).

Placer Dome Inc. produced gold at the South Deep Mine. In 2004, output was 6,665 kg from 1.1 Mt of ore milled compared with 6,854 kg from 979,000 t of ore milled in 2003. Cash costs increased to $394 per troy ounce of gold in 2004 from $301 per troy ounce of gold in 2003. Reserves amounted to 111 Mt at a grade of 7.8 g/t gold. Placer Dome planned to produce nearly 7,200 kg of gold at South Deep in 2005 (Placer Dome Inc., 2005, p. 21, 23, 36).

Thistle Mining Inc. of South Africa operated the President Steyn Mine in Free State. The company planned to produce 7,500 kg of gold in 2004 and to increase production to more than 9,300 kg by 2008. The increase would result from higher ore grades and an expansion of the ore treatment capacity. Production could increase eventually to 13,700 kg/yr after further increases in capacity. In 2003, reserves at President Steyn increased to 93,000 kg of contained gold from 47,000 kg in 2002 (Mining Review Africa, 2004b).

Anglo Platinum's production of refined gold from Rustenburg Base Metal Refiners declined to 3,418 kg in 2004 from 3,611 kg in 2003. Of this amount, 3,241 kg was attributable to Anglo Platinum's mining operations in 2004 compared with 3,571 kg in 2003; the remainder was attributable to purchased concentrates (Anglo American Platinum Corp., 2005, p. 86, 88).

The Rand Refinery in Germiston produced about 450,000 kg/yr of refined gold, which was 38% of the plant's capacity. About 290,000 kg/yr was attributable to domestic gold mines, and 10,000 kg/yr, to gold scrap from the jewelry industry. Roughly 150,000 kg/yr was attributable to imports, most of which were sourced from West Africa (Mining Review Africa, 2004c).

Iron Ore.—Assmang, Highveld Steel and Vanadium Corp. Ltd. of South Africa, and Kumba Resources Ltd. of South Africa mined iron ore. South Africa accounted for 3% of world iron ore production in 2004. National production of iron ore increased to 39.3 Mt in 2004 from 38.1 Mt in 2003. Iron ore exports amounted to $535 million in 2004 (Jorgenson, 2006, p. 40.25; Mining Journal, 2005).

Kumba Resources Ltd. operated the Sishen Mine in Northern Cape Province and the Thabazimbi Mine in Limpopo Province. The company's production of iron ore was 30.1 Mt in 2004, which was an increase of 1.8% compared with that of 2003. Output from the Sishen Mine amounted to 27.6 Mt; production was inhibited by the capacity of the Sishen/Saldanha railway (Kumba Resources Ltd., 2005, p. 33-34).

Kumba's exports of iron ore amounted to 20.9 Mt in 2004, which was an increase of 2.3% compared with that of 2003. The increase in the company's exports was partially attributable to the 10.8% increase in Chinese demand for steel in 2004. China accounted for 38% of Kumba's iron ore export revenues; Japan, 23%; the United Kingdom, 13%; Germany, 10%; and Austria, 9%. Kumba accounted for 4% of the world's seaborne iron ore trade (Kumba Resources Ltd., 2005, p. 2, 20, 34).

Mittal Steel South Africa Ltd. accounted for a majority of Kumba's domestic sales; the company had a contract with Kumba to purchase 6.25 Mt/yr of iron ore and the entire output of the Thabazimbi Mine. Kumba accounted for 81% of South Africa's total iron ore demand (Kumba Resources Ltd., 2005, p. 34).

In July 2004, Kumba completed a feasibility study on the expansion of the Sishen Mine. The expansion was likely to increase saleable iron ore production by 10 Mt/yr. Kumba planned to start production in mid-2007 and to reach full capacity by the beginning of 2009. The cost of the expansion was expected to be $461 million. Resources at Sishen were estimated to be 1.64 billion metric tons (Gt) at a grade of 64.9% iron (Kumba Resources Ltd., 2005, p. 43, 48).

Kumba also planned to develop the Sishen South project, which was located 70 km south of the Sishen Mine. Sishen South was expected to produce 9 Mt/yr of iron ore by 2010. The capital cost of the project was expected to be $342 million. The timing of the development of Sishen South depended on the availability of export routes through Coega or Saldanha. Resources at Sishen South were estimated to be 411 Mt at a grade of 64.5% iron (Kumba Resources Ltd., 2005, p. 43-44, 48).

Kumba was also conducting a feasibility study on the Phoenix project at the Thabazimbi Mine, which would produce 2 to 3 Mt/yr of iron ore and extend the life of the mine. The development of Thabazimbi depended on the negotiation of an agreement with Mittal. Resources at Thabazimbi were estimated to be 83 Mt at a grade of 62.7% iron (Kumba Resources Ltd., 2005, p. 44, 48).

Assmang produced iron ore at the Beeshoek Mine in Northern Cape. In financial year 2003-04, production at Beeshoek increased to 6.26 Mt from 5.81 Mt in financial year 2002-03. Resources at Beeshok amounted to 1.21 Gt at a grade of 64.6% iron, of which 462 Mt were reserves at a grade of 65.3% iron (Assmang Ltd., 2004a, p. 12; 2004b).

Assmang was engaged in exploration to increase its reserves at Beeshoek and was conducting a feasibility study on the development of the iron ore resources at the Bruce, the King, and the Mokaning properties. The feasibility study was expected to be completed in late 2005. If the feasibility study were to yield favorable results, the construction of a new mine was expected to be completed in 2008. The mine would have a capacity of 10 to 15 Mt/yr; Assmang's total iron ore production was expected to be more than 8 Mt in 2009, 10 Mt in 2011, and 14 Mt in 2012 (Assmang Ltd., 2004c; Motsepe, 2005, p. 27-28).

Highveld mined titaniferous magnetite at its Mapochs open pit mine near Roossenekal in the Mpumalanga Province. Mapochs had a capacity of 2.45 Mt/yr; average ore grades from the mine were 54.3% iron (Department of Minerals and Energy, 2004, p. 10).

Iron and Steel.—National production of crude steel was nearly unchanged in 2004 at 9.5 Mt. The production of pig

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iron declined to 6.01 Mt in 2004 from 6.23 Mt in 2003, and the production of direct-reduced iron (DRI) rose to 1.63 Mt from 1.54 Mt. South Africa's share of African pig iron output amounted to 74%; crude steel, 57%; and DRI, 26% (International Iron and Steel Institute, 2005, p. 3, 5, 11).

Iscor accounted for most of South Africa's production of crude steel at its Newcastle, Saldanha, Vanderbijlpark, and Vereeniging plants. In December 2004, Iscor's parent company merged with International Steel Group of the United States to form Mittal Steel Company N.V.

The production of liquid steel at Vanderbijlpark declined to 3.63 Mt in 2004 from 3.68 Mt in 2003 because of shutdowns for repairs. At Saldanha, production declined to 1.23 Mt in 2004 from 1.25 Mt in 2003 because of mechanical problems. At Newcastle and Vereeniging, production increased to 2.18 Mt from 2.15 Mt (Mittal Steel South Africa Ltd., 2005, p. 30-31, 35).

Mittal planned to increase liquid steel production at Vanderbijlpark by about 2 Mt/yr by the end of 2009. By the first half of 2006, Mittal expected to increase production by 325,000 t/yr with the installation of new DRI kilns. By the second half of 2006, the company planned to increase Vanderbijlpark's sinter plant capacity, increase production by 445,000 t/yr by relining blast furnace D, and gain an additional 660,000 t/yr from increased efficiency. By 2009, Mittal planned to increase production by an additional 355,000 t/yr by relining blast furnace C (Mittal Steel South Africa Ltd., 2005, p. 18).

Mittal's production of rolled steel products at Vanderbijlpark was about 3.4 Mt/yr; Newcastle and Vereeniging, nearly 2 Mt/yr; and Saldanha, about 1.3 Mt/yr. Vanderbijlpark produced a wide range of flat products that included steel slabs; plates; and hot-rolled, cold-rolled, galvanized, tin, and color-coated sheets. Saldanha produced mainly hot-rolled coil, and Newcastle and Vereeniging, long steel products. Mittal supplied about 80% of South Africa's demand for flat steel products; the company was Africa's leading flat steel producer (Mittal Steel South Africa Ltd., 2005, p. 28, 33).

Highveld operated a rolling mill at Witbank. In 2004, the company's production of rolled steel products was 674,013 t compared with 578,035 t in 2003 and 711,743 t in 2000. Scaw Metals (a subsidiary of Anglo American plc) increased production of rolled products at its Germiston plant to 458,000 t in 2004 from 352,000 t in 2003 (Anglo American plc, 2005, p. 118; Highveld Steel and Vanadium Corp. Ltd., 2005).

Columbus Stainless (Pty.) Ltd. operated South Africa's only stainless steel plant at Middleburg. Production amounted to 718,000 t in 2004 compared with 643,000 t in 2003 and 550,000 t in 2002. Columbus accounted for 3% of the world's stainless steel output in 2004 (Ferro-alloys Monthly, 2005).

Lead and Zinc.—South Africa's mine production of zinc declined to 32,310 t in 2004 from 41,400 t in 2003. The decrease in production was partially attributable to the shutdown of the Maranda copper-zinc mine in the third quarter of 2004 (Metorex Ltd., 2004). Lead mine production declined to 37,485 t in 2004 from 39,941 t in 2003.

Anglo American plc operated the Black Mountain lead-zinc-copper mine near Aggeneys in Northern Cape Province. In 2004, production at Black Mountain amounted to 28,200 t of zinc and 37,500 t of lead from 1.5 Mt of ore milled compared with 25,900 t of zinc and 39,600 t of lead from 1.45 Mt of ore milled in 2003. The development of the Deeps Mine at Black Mountain was likely to continue in 2005; zinc production was expected to increase. The final cost of the expansion at Black Mountain was expected to be $125 million (Anglo American plc, 2005, p. 10, 117).

Zinc Corp. of South Africa Ltd. (a subsidiary of Kumba Resources Ltd.) operated South Africa's only zinc refinery at Springs. In 2004, production declined to 104,000 t from 113,000 t because of shortages of concentrates created by lower domestic zinc mine production (Kumba Resources Ltd., 2005, p. 40).

Manganese.—About four-fifths of the world's manganese ore reserve base was located in South Africa. In 2004, South Africa's mine production of manganese ore increased to nearly 4.21 Mt from 3.5 Mt in 2003. Manganese ore exports amounted to $168 million in 2004 (Mining Journal, 2005).

Samancor operated the Mamatwan open pit mine and the Wessels underground mine near Hotazel in Northern Cape Province; these mines had a combined capacity of 3.4 Mt/yr. In 2004, Samancor's production of manganese ore increased to 2.52 Mt from 2.36 Mt. Reserves at Wessels were estimated to be 22 Mt at a grade of 37.5% manganese, and at Mamatwan, 9.9 Mt at a grade of 48% manganese (BHP Billiton Group, 2004, p. 3; 2005, p. 3; Mining Journal, 2005).

Assmang produced manganese ore at the Gloria and the Nchwaning Mines. In financial year 2003-04, production at the mines increased to 1.41 Mt from 1.37 Mt in financial year 2002-03. Resources at the mines were 631 Mt at a grade of 39.4% manganese, of which 131 Mt was reserves at a grade of 44.1% manganese. Ore grades at the Nchwaning Mine ranged from 43.3% to 46.3% manganese; and at the Gloria Mine, from 34.2% to 38.6% manganese. Resources increased to 631 Mt in 2004 from 156 Mt in 2003, and reserves, to 131 Mt from 119 Mt (Assmang Ltd., 2004a, p. 12; 2004b; Mining Journal, 2005).

In 2004, Assmang completed the sinking of the Number 3 Shaft at Nchwaning that increased the company's production capacity to 3.5 Mt/yr of manganese ore. Assmang planned to increase its production to nearly 2 Mt in 2005 and to more than 2.5 Mt by 2010. The capital cost of the expansion at Nchwaning was estimated to be $116 million (Assmang Ltd., 2004b; Motsepe, 2005, p. 29-30).

South Africa was the world's second ranked producer of ferromanganese in 2003. Samancor produced ferromanganese and silicomanganese at its plant at Meyerton. The company's production of manganese alloys was 504,000 t in 2004 compared with 469,000 t in 2003. Assmang produced ferromanganese and silicomanganese at the Cato Ridge plant in Kwa-Zulu Natal. In financial year 2003-04, production at Cato Ridge increased to 238,000 t from 229,000 t in financial year 2002-03. Highveld's production of silicomanganese was 137,606 t, which was nearly unchanged from that of 2003 (Assmang Ltd., 2004b; BHP Billiton Group, 2004, p. 3; 2005, p. 3; Highveld Steel and Vanadium Corp. Ltd., 2005).

Nickel.—Most of South Africa's nickel mine production was a coproduct of PGM mining. In 2004, national nickel mine production declined to 39,853 t from 40,842 t in 2003. Domestic nickel consumption amounted to about 25,000 t in 2004.

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Anglo Platinum increased its production of refined nickel at Rustenburg Base Metal Refiners to 22,300 t in 2004 from 22,100 t in 2003 and 19,200 t in 2000. About 21,200 t was attributable to Anglo Platinum's mining operations compared with 21,900 t in 2003 and 10,800 t in 2000 (Anglo American Platinum Corp., 2005, p. 86, 88).

In financial year 2003-04, Impala Platinum Holdings Ltd. (Implats) produced 9,500 t of refined nickel from its refinery northeast of Johannesburg compared with 6,700 t in financial year 2002-03. Production at this plant was from purchased concentrates and toll refining. Implats also produced nickel from its Impala PGM mines near Rustenburg in the North West Province; production of refined nickel from Impala declined to 6,900 t in financial year 2003-04 from 8,000 t in financial year 2002-03. Implats produced small amounts of nickel from the Marula PGM mine (Impala Platinum Holdings Ltd., 2004, p. 51, 54, 63).

African Rainbow Minerals Ltd. of South Africa operated the Nkomati nickel mine, which was South Africa's only primary nickel producer. Production at Nkomati was about 5,000 t/yr of nickel. The company planned to increase production to 16,000 t/yr of nickel. Resources at Nkomati were estimated to be 143 Mt at a grade of 0.47% nickel, of which 65 Mt was reserves at a grade of 0.5% nickel. The life of the mine was expected to be 15 years (Motsepe, 2005, p. 24-25).

Platinum-Group Metals.—South Africa was the world's leading producer of PGM in 2004. The country's share of world platinum production was 75%; palladium, 42%; and other PGM, 75%. South Africa's production of PGM increased to 286,156 kg in 2004 from 266,150 kg in 2003. In 2004, national exports of platinum amounted to $3.66 billion; palladium, $502 million; rhodium, $356 million; and ruthenium, $47.7 million (Mining Journal, 2005; George, 2006).

In 2004, Anglo Platinum produced 137,700 kg of refined PGM compared with 129,400 kg in 2003. About 130,100 kg was attributable to the company's mining operations in 2004 compared with 126,200 kg in 2003. Platinum produced from Anglo's mining operations amounted to 72,400 kg; palladium, 38,200 kg; and rhodium, nearly 7,500 kg (Anglo American Platinum Corp., 2005, p. 86, 88).

At the Rustenburg Section, platinum production increased to 26,900 kg in 2004 from 25,700 kg in 2003 because of higher output from the UG2 project. Anglo Platinum planned to increase platinum output at Rustenburg to between 28,000 kg/yr and 31,100 kg/yr. Production at the Amandelbult Section declined to 18,400 kg of platinum from 20,100 kg because of difficult geologic conditions and labor disputes. Output was expected to increase in 2005. At the Bafokeng-Raismone Platinum Mine, platinum output was expected to rise to more than 6,200 kg in 2005 from nearly 5,800 kg in 2004. The Western Limb Tailings Retreatment project produced nearly 2,100 kg of platinum in its first year of operation. Production at the Lebowa Platinum, the Potgietersrust Platinums, and the Union Mines was likely to remain unchanged (Anglo American Platinum Corp., 2005, p. 16-17, 42-48, 86, 88).

At the Modikwa Mine (a joint venture with African Rainbow Minerals), production of PGM rose to 8,603 kg in 2004 from 6,373 kg in 2003; platinum production rose to 3,546 kg from 2,681 kg in 2003. Increased production was attributable to a higher ore grade. By mid-2005, Modikwa was expected to reach its full planned production of 11,400 kg/yr of PGM, which included 5,000 kg/yr of platinum (Anglo American Platinum Corp., 2005, p. 98; Motsepe, 2005, p. 19).

In 2004, production at the Kroondal Mine (a joint venture with Aquarius Platinum Ltd. of South Africa) increased to 8,014 kg of PGM from 6,729 kg in 2003; platinum production increased to 4,823 kg from 4,132 kg. Higher production was attributable to an increase in the amount of ore milled. In the first quarter of 2005, Anglo Platinum and Aquarius planned to commission a new concentrator at Kroondal that was expected to increase Kroondal's production to 15,700 kg/yr of PGM (Aquarius Platinum Ltd., 2004, p. 3-7; 2005, p. 3-7).

Anglo Platinum planned to increase its total platinum production to about 105,000 kg in 2006. In December 2003, the company announced that it was scaling back its planned production to between 84,000 kg and 87,000 kg of platinum in 2006 because of the strength of the South African rand (Anglo American Platinum Corp., 2005, p. 17-18).

Implats operated the Impala Mines near Rustenburg in North West Province and the Marula Mine in Limpopo Province. In financial year 2003-04, production of refined PGM at Impala was 61,445 kg compared with 59,828 kg in financial year 2002-03. Implats planned to maintain production at between 59,000 kg/yr and 62,000 kg/yr of PGM, which included between 31,000 kg/yr and 34,000 kg/yr of platinum, for the 30-year life of the mines (Impala Platinum Holdings Ltd., 2004, p. 45-51).

In financial year 2003-04, platinum production at Marula amounted to 414 kg; palladium, 411 kg; and rhodium, 84 kg. Production was inhibited by difficult geologic conditions. Implats planned to increase platinum production at Marula to 3,100 kg in financial year 2006-07 and 3,900 kg in financial year 2008-09. The life of the mine was expected to be 25 years (Impala Platinum Holdings Ltd., 2004, p. 52-54).

Implats also operated a refinery northeast of Johannesburg; production at this plant was from purchased concentrates and toll refining. In financial year 2003-04, the refinery's production increased to 54,409 kg of PGM from 38,506 kg in financial year 2002-03. Implats planned to increase production to 62,000 kg of PGM in financial year 2006-07 and to more than 71,000 kg in financial year 2008-09 (Impala Platinum Holdings Ltd., 2004, p. 62-63).

African Rainbow Minerals and Implats were engaged in a joint venture to develop the Two Rivers Mine in Mpumalanga Province. The companies planned to produce nearly 7,200 kg/yr of PGM, which included 3,400 kg/yr of platinum. Production was expected to start in 2005; the mine was expected to reach its full capacity in 2008. Capital costs of the project were likely to be nearly $190 million. Resources at Two Rivers were estimated to be 117 Mt at a grade of 3.9 g/t PGM and gold. African Rainbow Minerals also planned to produce 3,100 kg/yr of PGM with the expansion of the Nkomati nickel mine (Motsepe, 2005, p. 20-21, 24-25).

Lonmin plc of the United Kingdom mined PGM at the Western Platinum Mine, the Eastern Platinum Mine, and the Karee Mine east of Rustenburg in the North West Province. From September 2003 to September 2004, Lonmin produced

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28,514 kg of platinum compared with 26,558 kg in the previous 12 months. Total production of PGM increased to 52,147 kg from 50,760 kg. Ore processed declined to 11.1 Mt from 11.4 Mt (Lonmin plc, 2005§).

Aquarius operated the Marikana Mines. In 2004, production of PGM at Marikana was 2,583 kg compared with 2,315 kg in 2003; platinum production rose to 1,720 kg from 1,573 kg. Higher production was attributable to increases in ore processed. In October 2004, Aquarius started construction on the Everest Mine, which was expected to be completed in December 2005. The company planned to reach full production of 7,000 kg/yr of PGM in 2006. Capital costs were expected to be $127 million. Reserves at Everest were estimated to be 26.8 Mt at a grade of 3.36 g/t PGM (Aquarius Platinum Ltd., 2004, p. 3-7; 2005, p. 3-8).

Silicon.—In 2004, Silicon Smelters (Pty.) Ltd. was the only domestic producer of silicon metal; the company increased its production to 50,500 t from 48,500 t in 2003. South Africa accounted for about 5% of world silicon metal production. National ferrosilicon production rose to 140,600 t in 2004 from 135,300 t in 2003. In 2004, Highveld produced 58,155 t of ferrosilicon compared with 55,453 t in 2003 from its plant at Witbank. Silicon Technology (Pty.) Ltd. also produced ferrosilicon (Bonga, 2005; Highveld Steel and Vanadium Corp. Ltd., 2005).

Silver.—National silver mine production was 71,600 kg in 2004 compared with 79,817 kg in 2003 and 144,143 kg in 2000. Silver was mined as a coproduct of copper, gold, lead, PGM, nickel, and zinc. In 2004, lead-zinc mines accounted for 55% of South Africa's silver production; gold mines, 32%; copper mines, 11%; and nickel and PGM mines, 2%. The Rand Refinery produced about 80,000 kg/yr of refined silver (Damarupurshad, 2005a; Mining Review Africa, 2004c; Mining Journal, 2005).

Titanium and Zirconium.—BHP Billiton Group and Rio Tinto plc mined ilmenite, rutile, and zircon, and produced titania slag at Richards Bay. In financial year 2003-04, the production of titania slag at Richards Bay declined by 12.5% because of oversupply in world markets.

In 2004, Kumba and its joint-venture partner Ticor Ltd. of Australia produced 459,000 t of ilmenite from the Hillendale Mine in KwaZulu Natal Province; production was unchanged from that of 2003. Rutile production increased by 18% to 20,000 t, and zircon production declined by 2% to 49,000 t. Kumba and Ticor planned to start production at the Fairbreeze Mine south of Hillendale in 2007. Resources at Fairbreeze were estimated to be 223 Mt at a grade of 3.6% ilmenite, and at Hillendale, 56 Mt at a grade of 3.7% ilmenite (Kumba Resources Ltd., 2005, p. 38, 45, 48).

Kumba and Ticor also operated the Empangeni smelter near the Hillendale Mine. In 2004, production of titania slag nearly tripled to 136,000 t; the companies planned to increase output to 250,000 t/yr (Kumba Resources Ltd., 2005, p. 2, 38).

Vanadium.—Highveld, Vametco Minerals Corp., and Xstrata mined vanadium from vanadiferous magnetite. South Africa was the world's leading producer of vanadium and accounted for 31% of global vanadium reserves in 2003. Although most of South Africa's vanadium production was exported, domestic consumption increased substantially in 2004 because of growth in the construction sector and rising demand for chemical applications (Kweyama, 2005).

Highveld produced vanadium from titaniferous magnetite ore at the Mapochs Mine. In 2004, the company produced 8,448 t of vanadium from 67,587 t of vanadium slag compared with 8,232 t of vanadium from 69,814 t of vanadium slag in 2003. Highveld also produced 5,258 t of vanadium in chemicals, ferrovanadium, and vanadium pentoxide (V_2O_5) in 2004 compared with 5,237 t in 2003 (Anglo American plc, 2005, p. 118; Highveld Steel and Vanadium Corp. Ltd., 2005).

Xstrata produced V_2O_5 at Rhovan and Vantech in Brits; the plants had a combined capacity of 16,600 t/yr of V_2O_5. In November 2004, Xstrata announced the permanent closure of the Vantech operation. Vantech was placed on care and maintenance in early 2004 after the Kennedy Vale deposit was depleted in December 2003. Xstrata's decision was influenced by the cost of developing the Steelpoortdrift deposit, the strength of the South African rand, and concerns about the sustainability of high vanadium prices. Production at Vantech was 548 t of V_2O_5 in 2004 compared with 4,632 t in 2003. At Rhovan, production increased to 9,035 t of V_2O_5 compared with 8,255 t in 2003. Xstrata also produced ferrovanadium at Rhovan; production declined to 5,910 t in 2004 from 6,306 t in 2003 (Ryan's Notes, 2004; Xstrata plc, 2005, p. 46, 176).

Industrial Minerals

Diamond.—South Africa was the world's fifth ranked diamond producer by volume, accounting for about 9% of world production. In 2004, national rough diamond production rose to about 14.3 million carats from 12.7 million carats in 2003. Kimberlites accounted for 13 million carats; alluvial deposits, 1.21 million carats; and marine deposits, 81,000 carats. The value of diamond that was cut and polished in South Africa amounted to about $500 million in 2004 (Northwest Territories Department of Industry, Tourism and Investment, 2005, p. 6, 9).

DeBeers Group accounted for most of South Africa's rough diamond production. In 2004, the company's production of diamond was more than 13.7 million carats from 33.8 Mt of ore milled compared with 11.9 million carats from 28.7 Mt of ore milled in 2003. Ore grades varied from 5.8 carats per 100 metric tons at the Koffiefontein Mine to 122 carats per 100 metric tons at the Venetia Mine (DeBeers Group, 2005, p. 50).

The production increase in 2004 was mostly attributable to the Kimberley and Venetia Mines. At Kimberley, production was 2.05 million carats from 9.07 Mt of ore milled in 2004 compared with 1.05 million carats from 5.96 Mt of ore milled in 2003; new retreatment technology was the most important factor in the increase. At Venetia, production was 7.19 million carats from 5.87 Mt of ore milled in 2004 compared with 6.6 million carats from 5.41 Mt of ore milled in 2003. In 2004, the Finsch Mine produced nearly 2.11 million carats; the Cullinan Mine, 1.3 million carats; the Namaqualand Mine, 909,706 carats; the Koffiefontein Mine, 113,481 carats; and The Oaks Mine, 68,943 carats (DeBeers Group, 2005, p. 42).

Trans Hex Group of South Africa operated the Baken, the Bloeddrif, the Reuning, and the Saxendrift Mines. In financial

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year 2003-04, the Baken Mine produced 88,100 carats; the Saxendrift Mine, 22,200 carats; the Bloedorf Mine, 14,500 carats; and the Reuning Mine, 13,700 carats (Trans Hex Group, 2005, p. 12-13).

SouthernEra Diamonds Inc. of Canada had a joint-venture agreement with Naka Diamond Mining Company for the Klipspringer Mine in Limpopo Province. The Klipspringer Mine had a capacity of 151,000 carats per year and an estimated life of 10 years. Resources were estimated to be 4.5 Mt at a grade of 46.5 carats per 100 metric tons. In December 2003, the mine was placed on care and maintenance because of the strength of the South African rand. Naka and SouthernEra were considering the treatment of stockpiles at Marsfontein. SouthernEra was awarded the Hope and the Prieska prospecting permits in April 2004; the company and its joint-venture partners planned to explore Harmony, Hope, and Prieska in 2005 (SouthernEra Diamonds Inc., 2005, p. 6-8, 14, 15).

Fluorspar.—Van den Heever Fluorspar Works, Vergenoeg Mining Corp. (Pty.) Ltd., and Witkop Fluorspar Mine (Pty.) Ltd. produced fluorspar. In 2004, national production of fluorspar rose to 265,000 t from 235,000 t in 2003. The increase was attributable to upgrades at the Vergenoeg Mine in December 2003 and the Witkop Mine in September 2004; the expansion at Witkop increased production to 180,000 t/yr. Additionally, the reduction in Chinese export quotas led to a shortage of fluorspar in the world market. South Africa's exports amounted to 233,000 t at a value of $28.5 million in 2004; domestic consumers of fluorspar included the cement and steel industries (Naledi, 2005).

Vermiculite.—South Africa was the world's leading producer of vermiculite; it accounted for nearly 40% of world production in 2004. National vermiculite production rose by 7.7% in 2004. The Palabora Mine accounted for most of South Africa's production of vermiculite. In 2004, production at Palabora increased to 193,400 t from 173,200 t in 2003 (Rio Tinto plc, 2005, p. 19; Willett and Potter, 2006).

Mineral Fuels

Coal.—In 2004, South Africa's production of coal increased to 242.7 Mt from 239.3 Mt in 2003. More than 99% of the country's coal output was bituminous coal. South Africa was Africa's leading producer of coal, accounting for 98% of continental production in 2004. In 2004, exports of coal amounted to $2.21 billion (Mining Journal, 2005).

Ingwe Coal Corp. Ltd. (a subsidiary of BHP Billiton Group) produced coal at the Douglas, the Khutala, the Klipspruit, the Koornfontein, the Middleburg, and the Rietspruit Mines in Mpumalanga Province. In 2004, Ingwe produced 55.3 Mt of coal compared with 54.3 Mt in 2003. The company had a joint-venture agreement with Xstrata for the Douglas and the Middleburg Mines, where production declined to 23.9 Mt in 2004 from 24.4 Mt in 2003. Sales to local utilities amounted to 32.7 Mt in 2004; exports, 20.5 Mt; and other South African customers, 1.4 Mt (BHP Billiton Group, 2004, p. 13; 2005, p. 12).

Anglo American increased its production of coal to nearly 54.5 Mt in 2004 from 51.7 Mt in 2003. The increase in output was broadly based, with production at New Vaal rising to 17.3 Mt from 16 Mt; at Goedehoop, to 6.46 Mt from 5.96 Mt; at New Denmark, to 4.98 Mt from 4.32 Mt; and at Kleinkopje, to 4.69 Mt from 4.38 Mt. Output also rose slightly in 2004 at the Kriel, the Greenside, and the Nooitgedacht Mines, which produced 11.1 Mt, 2.75 Mt, and 677,000 t, respectively. The Mafube Mine, which opened in 2004, produced 321,000 t. Higher production at these mines was attributable to increased demand from South African utility Eskom. Anglo planned to acquire new equipment to increase production at New Demark in 2005. In 2004, production at the Bank Mine declined to 2.73 Mt from 3.23 Mt in 2003 because of difficult mining conditions (Anglo American plc, 2005, p. 11, 114).

In financial year 2003-04, Sasol Ltd. of South Africa increased its coal production to 52.4 Mt from 51.3 Mt in financial year 2002-03. At the Secunda Mining Complex, which included the Bossjesspruit, the Brandspruit, the Middelbult, the Syferfontein, and the Twistdraai Mines, output rose to 46.2 Mt from 45.4 Mt. At the Sigma Mine, production increased to 6.2 Mt from 5.9 Mt. Sasol consumed 47 Mt of coal in the production of synthetic fuels and other chemicals and exported 3.6 Mt in financial year 2003-04 (Sasol Ltd., 2004, p. 31-32).

Sasol was engaged in a joint-venture agreement with Anglo American to develop the Kriel South coal reserves and to expand the Syferfontein Mine. Each of these projects was expected to increase coal production by 5 Mt/yr starting in July 2005. Anglo American planned to sell the output of Kriel South to Sasol for synthetic fuel production. The project was expected to cost $169 million. Sasol's coal reserves amounted to 1.55 Gt in 2004, which included 155 Mt at Syferfontein and South Kriel, 142 Mt at Bossjesspruit, and 137 Mt at Middlebult (Sasol Ltd., 2004, p. 32, 88).

Eyesizwe Coal (Pty.) Ltd. of South Africa produced 25 Mt/yr of coal from the Arnot, the Glisa, the Matla, the Mafube, and the New Clydesdale Mines. The company exported about 1.2 Mt/yr of coal; Europe accounted for 90% of Eyesizwe's exports, and South America, 10%. In late 2004, Eyesizwe and Anglo American started production at the Mafube Mine in Mpumalanga Province, which produced at a rate of 1.2 Mt/yr. The companies planned to finish a feasibility study to increase production at Mafube by between 4 and 5 Mt/yr in 2005. If the study were to yield favorable results, production could start in 2007. Kumba and Eyesizwe were engaged in a joint venture to build the Inyanda Coal Mine near Witbank with a capacity of 1 Mt/yr (Kumba Resources Ltd., 2005, p. 45; Reuters, 2005).

Kumba operated the Grootegeluk and the Tshikandeni Mines in Limpopo Province and the Leeuwpan Mine in Mpumalanga Province. The company's production amounted to more than 19.4 Mt in 2004, which was an increase of 2.5% from that of 2003. Output increased at the Grootegeluk Mine, which produced 17.4 Mt of coal in 2004. At the Tshikandeni Mine, production increased by 15% in 2004. Sales to Eskom amounted to nearly 14 Mt; other domestic consumers, 4.1 Mt; and exports, 1.1 Mt (Kumba Resources Ltd., 2005, p. 36).

Kumba planned to increase its production to 21.7 Mt/yr with expansions that included 1 Mt/yr of new capacity at the Leeuwpan Mine and 530,000 t/yr at the Grootegeluk Mine. These projects were approved in August 2004; the expansions

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at Leeuwpan and Grootegeluk were expected to be complete in August 2005 and July 2006, respectively. By March 2005, Kumba also expected to complete a prefeasibility study on the Waterburg development, which could increase production at the Grootegeluk Mine by an additional 6 Mt/yr. If the study yielded favorable results, the company planned to complete a feasibility study by March 2006. Production from the expanded mine could start by early 2008 (Kumba Resources Ltd., 2005, p. 44-45).

Xstrata operated 11 coal mines at Breyten, Carolina, Ermelo, and Witbank. In 2004, the company's coal production increased to 16.9 Mt from 14.9 Mt in 2003. Production at the Tavistock Mine rose to 1.88 Mt from 1.42 Mt because of upgrades to the beneficiation plant and mining equipment in 2003 and 2004. At the South Witbank Mine, output rose to 1.77 Mt from 1.46 Mt because of greater efficiencies in the production process. Production at the Goedgevonden Mine increased to 1.1 Mt from 163,000 t; Xstrata planned to increase output to 1.5 Mt/yr by 2008. At the Phoenix Mine, production rose to 1.66 Mt from 846,000 t. Output declined from 1.26 Mt to 920,000 t at the Spitzkop Mine and from nearly 1.13 Mt to 814,000 t at the Waterpan Mine (Xstrata plc, 2005, p. 47-48, 179; undated§).

Petroleum.—South Africa produced modest amounts of crude petroleum; most of the country's output of refined petroleum products was derived from imports. In 2004, South Africa's consumption of petroleum products amounted to 525 million barrels (Mbbl) compared with 513 Mbbl in 2003 and 462 Mbbl in 2000. South Africa accounted for 20% of African petroleum products consumption and nearly 1% of world petroleum products consumption (British Petroleum plc, 2005, p. 9).

Uranium.—Anglogold Ashanti mined uranium as a coproduct of gold at its Vaal Reefs operations. In 2004, the production of uranium oxide declined to 887 t from 894 t in 2003 and 1,015 t in 2000. The company planned to increase production because of higher uranium prices. South Africa's entire production of uranium was exported in 2004 (Damarupurshad, 2005a).

Outlook

Capacity expansions by numerous producers were likely to lead to higher production of coal, ferrochromium, fluorspar, iron ore, manganese, nickel, PGM, and steel for the next 5 years. These expansions depended upon the continuation of the broad-based increase in world demand for minerals. Factors that could inhibit these plans included the strength of the South African rand and the high rates of HIV infection in the mining workforce.

References

Amey, E.B., 2006, Gold: U.S. Geological Survey Mineral Commodity Summaries 2006, p. 74-75.

Anglo American Platinum Corp., 2005, Business report 2004: Johannesburg, South Africa, Anglo American Platinum Corp., 196 p.

Anglo American plc, 2005, Annual report 2004: London, United Kingdom, Anglo American plc, 124 p.

AngloGold Ashanti Ltd., 2005, Annual report 2004: Johannesburg, South Africa, AngloGold Ashanti Ltd., 188 p.

Aquarius Platinum Ltd., 2004, Quarterly report 31 December 2003: Bedfordview, South Africa, Aquarius Platinum Ltd., 20 p.

Aquarius Platinum Ltd., 2005, Quarterly report 31 December 2004: Bedfordview, South Africa, Aquarius Platinum Ltd., 20 p.

Assmang Ltd., 2004a, Annual report 2004: Johannesburg, South Africa, Assmang Ltd., 54 p.

Assmang Ltd., 2004b, Financial results for the year ended 30 June 2004: Johannesburg, South Africa, Assmang Ltd., 1 p.

Assmang Ltd., 2004c, Financial results for the year ended 31 December 2004: Johannesburg, South Africa, Assmang Ltd., 1 p.

BHP Billiton Group, 2004, BHP Billiton production report for the quarter ended 31 December 2003: Melbourne, Australia, BHP Billiton Group press release, January 29, 18 p.

BHP Billiton Group, 2005, BHP Billiton production report for the quarter ended 31 December 2004: Melbourne, Australia, BHP Billiton Group press release, January 27, 15 p.

Bonga, Mpumzi, 2005, Silicon, *in* South Africa's mineral industry 2004/2005: Johannesburg, South Africa, Department of Minerals and Energy, p. 115-117.

British Petroleum plc, 2005, Statistical review of world energy June 2005: London, United Kingdom, British Petroleum plc, 41 p.

Damarupurshad, Ashok, 2005a, Silver, *in* South Africa's mineral industry 2004/2005: Johannesburg, South Africa, Department of Minerals and Energy, p. 38-42.

Damarupurshad, Ashok, 2005b, Uranium, *in* South Africa's mineral industry 2004/2005: Johannesburg, South Africa, Department of Minerals and Energy, p. 54-58.

DeBeers Group, 2005 Annual review 2004: Johannesburg, South Africa, DeBeers Group, 64 p.

Department of Minerals and Energy, 2004, Ferrous mineral commodities produced in the Republic of South Africa 2004: Johannesburg, South Africa, Department of Minerals and Energy, 35 p.

Durban Roodepoort Deep Ltd., 2003, Report to shareholders for the 4th quarter and year ended 30 June 2003: Parktown, South Africa, Durban Roodepoort Deep Ltd., 6 p.

Durban Roodepoort Deep Ltd., 2004a, Report to shareholders for the 2nd quarter ended 31 December 2003 of the 2004 financial year: Parktown, South Africa, Durban Roodepoort Deep Ltd., 6 p.

Durban Roodepoort Deep Ltd., 2004b, Report to shareholders for the 4th quarter ended 30 June 2004 of the 2004 financial year: Parktown, South Africa, Durban Roodepoort Deep Ltd., 6 p.

Durban Roodepoort Deep Ltd., 2005, Report on activities for the second quarter ended 31 December 2004 of the 2005 financial year: Parktown, South Africa, Durban Roodepoort Deep Ltd., 9 p.

Ferro-alloys Monthly, 2005, World alloy steels production: Ferro-alloys Monthly, no. 158, October, p. 10.

George, M.W., 2006, Platinum group metals, *in* Metals and minerals: U.S. Geological Survey Minerals Yearbook 2004, v. I, p. 57.1-57.12.

Gold Fields Ltd., 2003, Quarter and year ended results to 30 June 2003: Johannesburg, South Africa, Gold Fields Ltd., 18 p.

Gold Fields Ltd., 2004a, Quarter ended 31 December 2003: Johannesburg, South Africa, Gold Fields Ltd., 18 p.

Gold Fields Ltd., 2004b, Results for the quarter and year ended 30 June 2004: Johannesburg, South Africa, Gold Fields Ltd., 18 p.

Gold Fields Ltd., 2005, Quarter ended 31 December 2004: Johannesburg, South Africa, Gold Fields Ltd., 18 p.

Harmony Gold Mining Company Ltd., 2003, Review for the quarter and financial year ended 30 June 2003: Melrose Arch, South Africa, Harmony Gold Mining Company Ltd., 36 p.

Harmony Gold Mining Company Ltd., 2004a, Review for the quarter ended 31 December 2003: Melrose Arch, South Africa, Harmony Gold Mining Company Ltd., 36 p.

Harmony Gold Mining Company Ltd., 2004b, Review for the quarter ended 30 June 2004: Melrose Arch, South Africa, Harmony Gold Mining Company Ltd., 52 p.

Harmony Gold Mining Company Ltd., 2005, Review for the quarter ended 31 December 2004: Melrose Arch, South Africa, Harmony Gold Mining Company Ltd., 56 p.

Highveld Steel and Vanadium Corp. Ltd., 2005, Results for the year ended 31 December 2004: Witbank, South Africa, Highveld Steel and Vanadium Corp. Ltd., unpaginated.

Impala Platinum Holdings Ltd., 2004, Annual report 2004: Marshalltown, South Africa, Impala Platinum Holdings Ltd., 153 p.

Digitized by Google

International Iron and Steel Institute, 2005, Steel statistical yearbook 2005: Brussels, Belgium, International Iron and Steel Institute, 104 p.
International Monetary Fund, 2005, World economic outlook—Building institutions: Washington, DC, International Monetary Fund, September, 293 p.
Jorgenson, J.D., 2006, Iron ore, *in* Metals and minerals: U.S. Geological Survey Minerals Yearbook 2004, v. I, p. 40.1-40.28.
Kumba Resources Ltd., 2005, Annual report 2004: Pretoria, South Africa, Kumba Resources Ltd., 182 p.
Kweyama, N., 2005, Vanadium, *in* South Africa's mineral industry 2004/2005: Johannesburg, South Africa, Department of Minerals and Energy, p. 118-120.
Metorex Ltd., 2004, Update on Ruashi project: Johannesburg, South Africa, Metorex Ltd. press release, October 8, 5 p.
Mining Journal, 2005, South Africa—Political and economic challenges: Mining Journal, July 15, p. 18-22.
Mining Review Africa, 2004a, Avgold deal consolidates Harmony further in the Free State: Mining Review Africa, no. 2, p. 50-53.
Mining Review Africa, 2004b, Plans to expand production at President Steyn: Mining Review Africa, no. 2, p. 44-48.
Mining Review Africa, 2004c, Rand refinery looks for competitive advantage: Mining Review Africa, no. 6, p. 12-15.
Mittal Steel South Africa Ltd., 2005, Annual report 2004: Vanderbijlpark, South Africa, Mittal Steel South Africa Ltd., 186 p.
Motsepe, Patrice, 2005, African Rainbow Minerals Ltd.—Presentation at Indaba 2005: Africa Mining Investment Conference, Cape Town, South Africa, February 8-10, 2005, 35 p.
Mwape, P., Roberts, M.J., Mokwena, E., Tjatjie, T., and Phale, M., 2005, General review, *in* South Africa's mineral industry 2004/2005: Johannesburg, South Africa, Department of Minerals and Energy, p. 1-23.
Naledi, Olga, 2005, Fluorspar production and developments during 2004/05: MB Bulletin, v. 18, no. 2, July, p. 5-6.
Northwest Territories Department of Industry, Tourism and Investment, 2005, 2005 Diamond industry report—Diamond facts: Yellowknife, Northwest Territories, Canada, Northwest Territories Department of Industry, Tourism and Investment, 36 p.
Papp, J.F., 2006, Chromium, *in* Metals and minerals: U.S. Geological Survey Minerals Yearbook 2004, v. I, p. 17.1-17.25.
Placer Dome Inc., 2005, Annual report 2004: Vancouver, British Columbia, Canada, Placer Dome Inc., 92 p.
Potter, M.J., 2006, Kyanite and related materials: U.S. Geological Survey Mineral Commodity Summaries 2006, p. 94-95.
Reuters, 2005, Eyesizwe plans more coal output, exports: Reuters press release, April 14, 2 p.
Rio Tinto plc, 2005, Fourth quarter 2004 operations review: London, United Kingdom, Rio Tinto plc, 23 p.
Ryan's Notes, 2004, Xstrata to permanently shut Vantech: Ryan's Notes, v. 10, no. 45, November 8, p. 1.
Sasol Ltd., 2004, Form 20-F 2004: Rosebank, South Africa, Sasol Ltd., 311 p.
SouthernEra Diamonds Inc., 2005, Annual report 2004: Toronto, Ontario, Canada, SouthernEra Diamonds Inc., 16 p.
Trans Hex Group, 2005, Annual report 2005: Cape Town, South Africa, Trans Hex Group, 78 p.
Willett, J.C., and Potter, M.J., 2006, Vermiculite, *in* Metals and minerals: U.S. Geological Survey Minerals Yearbook 2004, v. I, p. 81.1-81.7.
Xstrata plc, 2005, Annual report 2004: Zug, Switzerland, Xstrata plc, 180 p.

Internet References

International Monetary Fund, 2005 (September), South Africa, World Economic Outlook Database, accessed December 16, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.
Lonmin plc, 2005, 5 Year Operating Statistics, accessed December 30, 2005, at URL http://www.lonmin.com/OurBusiness/Platinum/5YearOperatingStatistics/tabid/105/Default.aspx.
Samancor Ltd., [undated], Samancor—Operations and locations—Overview, accessed December 27, 2005, at URL http://www.samancorcr.com/content.asp?submID=13.
Xstrata plc, undated, Coal, accessed December 29, 2005, at URL http://www.xstrata.com/prod_coal.php.

TABLE 1
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
METALS						
Aluminum metal, primary		673,486	662,497	706,916	738,000 [r]	863,000
Antimony concentrate:						
Gross weight		6,400	8,320	9,910	9,000	8,400 [e]
Sb content (58% Sb)		3,710	4,827 [r]	5,746	5,291 [r]	4,967
Chromiun, gross weight:						
44% to 48% chromic oxide	thousand metric tons	2,261	2,180	2,459	2,640	2,888
Less than 44% chromic oxide	do.	4,360	3,322	3,977	4,766	4,789
Total	do.	6,621	5,502	6,436	7,406	7,677
Cobalt:						
Mine output, Co content[e]		580	550	540	404	280
Refinery output:		397	371	366	271	309
Copper:						
Mine (company output), Cu content		137,092	141,865	129,589	120,800 [r]	102,577
Metal:						
Smelter		172,800	142,500	119,667	112,025	89,300
Refined, primary		126,100	132,078	101,000	111,000 [r]	91,498
Gold, primary	kilograms	430,800	394,800	398,523 [r]	373,300 [r]	340,500

See footnotes at end of table.

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TABLE 1--Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
METALS--Continued						
Iron and steel:						
Ore and concentrate:						
Gross weight	thousand metric tons	33,707	34,757	36,484	38,086	39,322
Fe content (62%-65%)	do.	21,570	22,240	23,200	24,200	24,800
Metal:						
Pig iron	do.	6,292 [r]	5,820 [r]	5,823 [r]	6,234	6,011
Direct-reduced iron	do.	1,526 [r]	1,556 [r]	1,702 [r]	1,542	1,633
Ferroalloys, electric arc furnace:						
Chromium ferroalloys	do.	2,574 [r]	2,141	2,351	2,813 [r]	2,965
Ferromanganese	do.	597	524	619	607 [r]	612
Ferrosilicon	do.	109	108	142	135 [r]	141
Ferrovanadium[e]	do.	18	18	25	27 [r]	25
Silicomanganese[e]	do.	238	220	273	301 [r]	310
Silicon metal	do.	41	39	43	49 [r]	51
Other	do.	30	64	85	80	80 [e]
Total[e]	do.	3,610 [r]	3,110 [r]	3,540 [r]	4,010 [r]	4,180
Steel:						
Crude	do.	8,481	8,821	9,100	9,481 [r]	9,504
Stainless		436	440	550	643	718
Lead:						
Concentrate, Pb content		75,262	50,771	49,444	39,941	37,485
Refined, secondary		46,200	53,000	60,900 [r]	64,900 [r]	64,100
Manganese:						
Ore and concentrate, gross weight:						
Metallurgical:						
More than 48% manganese	thousand metric tons	2,047	2,082	1,600	1,619	1,988
45% to 48% manganese	do.	302	--	728	178	372
40% to 45% manganese	do.	235	326	19	783	1,041
30% to 40% manganese	do.	1,029	832	955	905	789
Total	do.	3,613	3,240	3,302	3,485	4,190
Chemical, 35% to 65% manganese dioxide	do.	22	26	20	16	17
Grand total	do.	3,635	3,266	3,322	3,501	4,207
Metal, electrolytic[e]	do.	40	40	40	40	40
Nickel:						
Mine output, concentrate, nickel content[e]		36,616	36,443	38,546	40,842	39,853
Metal, electrolytic		30,900	30,500 [e]	31,646	40,800 [r]	39,900
Platinum-group metals:						
Iridium	kilograms	NA	NA	3,682	6,444	5,988
Platinum	do.	114,459	130,307	132,897 [r]	148,348	159,862
Palladium	do.	55,818	62,601	63,758 [r]	70,946	78,029
Rhodium	do.	12,067	13,507	15,175 [r]	16,816	16,743
Ruthenium	do.	19,427	19,329	21,022 [r]	23,537	25,531
Other[2]	do.	4,999	4,169	107 [r]	59	3
Total	do.	206,770	229,913	236,641 [r]	266,150	286,156
Silver	do.	144,143	109,570	113,142 [r]	79,817 [r]	71,600
Titanium:[e]						
Ilmenite concentrate	thousand metric tons	1,800	1,750	1,800	2,000	1,900
Rutile concentrate	do.	130	120	120	150	150
Total	do.	1,930	1,870	1,920	2,150	2,050
Titaniferous slag[3]	do.	1,057	1,090	1,150	1,350	1,300
Uranium oxide		1,015	1,065	998	894 [r]	888
Vanadium, vanadium metal content		18,021	18,184	25,227	27,172 [r]	23,302

See footnotes at end of table.

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TABLE 1--Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
METALS--Continued						
Zinc:						
Concentrate:						
Gross weight		116,100	113,400	118,900	103,100	80,000 [e]
Zn content		63,590 [r]	61,560 [r]	64,580 [r]	41,400 [r]	32,310
Metal, smelter, primary		103,000	109,000	111,000 [r]	113,000 [r]	104,000
Zirconium concentrate (baddeleyite and zircon)[e]		253,000	245,000	274,000	300,000	302,000 [4]
INDUSTRIAL MINERALS						
Andalusite		182,674	193,225	165,087 [r]	164,921 [r]	234,625
Asbestos, chrysotile		18,782	13,393	--	6,218	--
Barite		1,628	--	--	--	--
Cementitious products:						
Cement, finished product, sales	thousand metric tons	7,971	8,036	8,525	8,883	10,500 [e]
Granulated slag, fly ash, and others, sales	do.	1,020	1,129	1,099	1,280	1,510 [e]
Total	do.	8,991	9,165	9,624	10,163	12,010
Clays:						
Attapulgite		10,287	9,299	13,288 [r]	14,585	20,419
Bentonite		90,100 [r]	108,300 [r]	101,100 [r]	145,060	55,859
Fire clay		112,637	141,303	101,150	90,604	133,258
Flint clay, raw and calcined		47,256	50,848	41,963	53,279	53,367
Kaolin		89,200 [r]	83,500 [r]	86,700 [r]	86,365 [r]	81,901
Brick clay, local sales	thousand metric tons	5,347	5,823	6,203	7,593	9,360
Diamond, natural:						
Gem	thousand carats	4,316	4,465	4,350	5,144	5,800 [e]
Industrial	do.	6,474	6,698	6,526	7,540	8,500 [e]
Total	do.	10,790	11,163	10,876	12,684	14,293
Feldspar		66,774	66,736	57,197	57,738	53,044
Fluorspar:						
Acid-grade		201,737	272,068	216,000 [r, e]	221,000 [r]	250,000 [e]
Metallurgical-grade		10,618	14,319	11,000 [r, e]	14,000 [r]	15,000 [e]
Total		212,355	286,387	227,000 [r]	235,000	265,000
Gemstones, semiprecious, Tiger's eye[e]	kilograms	80,000	80,000	-- [r, 4]	-- [r, 4]	-- [e]
Gypsum, crude		413,105	382,830	421,861 [r]	394,069	452,271
Industrial or glass sand (silica)	thousand metric tons	2,138	2,132	2,262	2,312	2,174
Lime	do.	1,391	1,615	1,585 [r]	1,518 [r]	1,738
Magnesite, crude		63,000 [r]	36,500 [r]	87,200 [r]	86,100 [r]	87,000 [e]
Mica, scrap and ground		708	937	880 [r]	1,003	901
Nitrogen, N content of ammonia		560,200	505,900	491,900	493,200	459,100
Perlite[e]		400	400	400	400	400
Phosphate rock:						
Gross weight	thousand metric tons	2,796	2,550	2,803	2,643	2,735
Phosphorus pentoxide content	do.	1,083	995	1,086	1,030	1,070
Pigments, mineral, natural:						
Ochers		550	801	143	608	360
Oxides		80	51	109	156	152
Total		630	852	252	764	512
Salt		345,632	353,998	429,429 [r]	441,306 [r]	394,775
Silica	thousand metric tons	2,137	2,127	2,239 [r]	2,448 [r]	2,388
Sodium sulfate, natural		49,712	57,759	53,793	52,813	56,267
Stone, n.e.s.:						
Dimension:						
Granite and norite[5]		952,200 [r]	846,700 [r]	705,800 [r]	461,300 [r]	527,100
Slate		24,952	40,984	24,386	40,700 [r]	47,500

See footnotes at end of table.

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TABLE 1--Continued

SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
INDUSTRIAL MINERALS--Continued						
Stone, n.e.s.--Continued:						
Crushed and broken:						
Limestone and dolomite	thousand metric tons	19,279 [r]	18,946 [r]	20,738 [r]	21,267 [r]	21,961
Quartzite	do.	7,965	7,412	318	--	--
Shale:						
For cement	do.	294	243	275	345	357
Other[5]	do.	7,358	67	67	49	50 [e]
Total	do.	7,652	310	342	394	407 [e]
Aggregate and sand, n.e.s.	do.	28,597 [r]	27,632 [r]	28,916 [r]	32,587 [r]	44,437
Sulfur:						
S content of pyrite (53.45%)	do.	146	150	183	176 [r]	165
Byproduct:						
Metallurgy	do.	100 [e]	265 [e]	179 [r]	174 [r]	180
Petroleum	do.	202	123	170 [r]	264 [r]	288
Total	do.	448	538	532 [r]	614	633
Talc and related materials:						
Talc		5,600	3,030	2,511	6,719	8,115
Pyrophyllite (wonderstone)		11,989	14,047	15,587	14,350	28,777
Vermiculite		208,835	156,632	210,000	182,802 [r]	196,893
MINERAL FUELS AND RELATED MATERIALS						
Coal (saleable product):						
Anthracite	thousand metric tons	1,618	1,607 [r]	1,305	1,206	1,247
Bituminous	do.	222,500	221,882	218,895	238,105	241,500
Total	do.	224,118	223,489	220,200	239,311	242,747
Natural gas	million cubic meters	2,088	1,800 [e]	2,000 [e]	2,500 [e]	2,500 [e]
Petroleum:[6]						
Crude	thousand 42-gallon barrels	6,606	13,870	10,950	4,068	6,769
Refinery products:						
Liquefied petroleum gases	do.	4,000	3,758 [r]	3,677 [r]	3,700 [r,e]	3,700 [e]
Gasoline	do.	67,900	67,796 [r]	73,077 [r]	73,000 [r,e]	73,000 [e]
Jet fuel	do.	13,900	13,829 [r]	16,726 [r]	17,000 [r,e]	17,000 [e]
Kerosene	do.	11,700	11,108 [r]	4,754 [r]	4,800 [r,e]	4,800 [e]
Distillate fuel oil	do.	51,500	53,339 [r]	59,620 [r]	60,000 [r,e]	60,000 [e]
Residual fuel oil	do.	34,700	32,221 [r]	34,452 [r]	34,000 [r,e]	34,000 [e]
Other, includes lubricants and greases[e]	do.	18,250 [4]	19,500 [r]	20,800 [r]	21,000 [r,e]	21,000 [e]
Total[e, 7]	do.	201,950 [4]	202,000	213,000 [r]	214,000 [r,e]	214,000 [e]

[e]Estimated; estimated data are rounded to no more than three significant figures; may not add to totals shown. NA Not available. [p]Preliminary. [r]Revised. -- Zero.

[1]Table includes data available through January 24, 2006.

[2]Difference between total production reported by the South African Department of Minerals and Energy, Mineral Development Branch, Mineral Economics Directorate and palladium, platinum, and rhodium supplies (shipments) reported in Johnson and Matthey Annual Platinum Review. Includes iridium and ruthenium production plus excess palladium, platinum, and rhodium inventory.

[3]Except for about 45,000 metric tons per year of slag derived from titaniferous magnetite by Highveld Steel and Vanadium Corp. Ltd., titaniferous slag is all from the smelting of ilmenite and likely represents most of that mineral's production, for which data are unavailable.

[4]Reported figure.

[5]Converted from reported cubic meters by using 1 cubic meter=2.7 tons.

[6]In addition, Sasol Ltd. produced about 67 million barrels per year of synthetic liquid petroleum fuels from coal.

[7]Excludes refinery fuel and losses.

Source: Mineral Economics Directorate, South Africa Department of Minerals and Energy.

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The Mineral Industry of Sudan

By Thomas R. Yager

In Sudan, rising production of crude petroleum in recent years has substantially increased the mineral sector's influence on the national economy. Other mineral commodities produced included cement, chromite, gold, gypsum, marble, refined petroleum products, salt, semimanufactured steel, and silver. Sudan is also known to have deposits of barite, copper, iron ore, kyanite, lead, nickel, talc, tungsten, wollastonite, and zinc.

Sudan's real gross domestic product (GDP) increased by 7.3% in 2004 after rising by 6% in 2003. In 2003, the mining sector accounted for 10% of the GDP; manufacturing, 8%; building and construction, 5%; and electricity and water, 2%. In 2004, the nominal GDP amounted to about $77 billion when adjusted for purchasing power parity. Per capita GDP at purchasing power parity was about $2,200 (International Monetary Fund, 2005, p. 208; 2005§[1]; Bank of Sudan, undated, p. 27).

Civil war and social strife in Sudan limited, to a large extent, investment in the mineral sector and other sectors of the economy. Sanctions by the United Nations (1996) and the United States (1997) set legal barriers to investment in the country and were followed by the Sudan Peace Act that was ratified by the Congress of the United States in 2002. The purpose of the Sudan Peace Act was to block loans from international financial institutions if the Government of Sudan rejected negotiations with the Sudanese People's Liberation Army (SPLA). Revenues from petroleum sales, which allegedly were used to finance operations in the Sudan conflicts, constituted one of the reasons for promulgating the Act (U.S. Department of the Treasury, 2000; Africa Energy Intelligence, 2002).

In May 2004, the Government and the SPLA signed six protocols on issues that related to the peace process. The Government and the SPLA previously signed an agreement to share Sudan's petroleum revenues in December 2003. On December 31, 2004, the Government signed a permanent cease-fire with the SPLA, and an agreement on the implementation of the protocols was signed in May (United Nations Integrated Regional Information Networks, 2005).

Commodity Review

Metals

Gold.—The Ariab Mining Company Ltd. (AMC) operated Sudan's only large-scale gold mine, which included the Baderuk, the Hadal Auatib, and the Oderuk deposits. The company held other concessions in Sudan. AMC was expected to produce 5,000 kilograms (kg) of gold in 2005 (Sudan News Agency, 2004).

Artisanal miners produced gold at Gugub in the Ingessana Hills and on the Blue Nile River in the Balguwa region in southeastern Sudan. Red Rock Mining (a subsidiary of Sudan Master Technology) planned to develop a mining operation at the deposit worked by artisanal miners in Balguwa. The company purchased a gold-processing plant in early 2004 (Heins, 2005).

In 2004, national gold exports were reported to be 6,673 kg at a value of $50.4 million, or about 1% of total exports. In addition to the gold produced and exported by AMC and Sudanese artisanal miners, some of Ethiopia's artisanal gold output was reported to be smuggled through Sudan (Bank of Sudan, 2004).

Iron and Steel.—Sudan Master Technology operated a meltshop and rolling mill in Giad Industrial City. In 2003, the production of rebar at Giad Industrial City increased to 63,936 metric tons (t) compared with 53,035 t in 2002. Hafez el Barbary and Sudanese Malaysian Co. had a combined galvanized steel production capacity of 15,000 metric tons per year (t/yr) (Glasson, 2003; Bank of Sudan, undated, p. 41).

In 2003, Sudan's apparent consumption of finished steel amounted to 405,000 t compared with 289,000 t in 2002 and 398,000 t in 1998. In 2004, imports of iron and steel were $342 million compared with $225 million in 2003. Iron and steel accounted for 8% of Sudan's total imports (Bank of Sudan, 2004; International Iron and Steel Institute, 2004, p. 91).

Industrial Minerals

Cement.—The Atbara and the Rabak cement plants had a combined capacity of 500,000 t/yr. In 2003, production at Atbara rose to 199,900 t from 162,800 t (revised) in 2002; production at Rabak rose to 72,000 t from 42,000 t (revised). Higher cement production was the result of maintenance and rehabilitation at Atbara and Rabak (Bank of Sudan, undated, p. 46).

Mineral Fuels

In 2004, Sudan's production of crude petroleum increased to about 118 million barrels (Mbbl) from 103.4 million barrels (revised) in 2003 and 87.76 Mbbl in 2002. Sudan accounted for nearly 4% of African crude petroleum production in 2003. In 2004, petroleum reserves were no less than 2.6 billion barrels (Gbbl).

The Greater Nile Petroleum Operating Company (GNPOC), which was a joint venture of China National Petroleum Corp. (CNPC) (40%), Petronas Carigali Overseas Shd. Bhd. of Malaysia, (30%), ONGC Videsh Ltd. of India (25%), and Sudan Petroleum Company Ltd. (Sudapet) (5%), held Blocks 1, 2, and 4 in south-central Sudan. GNPOC produced crude petroleum from the Bamboo, the Diffra, the El Toor, the Grand Heglig, the Khairat Northeast, the Tooma South, and the Unity oilfields. In 2004, GNPOC produced 314,800 barrels per day (bbl/d) from Blocks 1, 2, and 4 compared with 283,400 bbl/d in 2003.

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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Reserves in Blocks 1, 2, and 4 were estimated to be more than 1 Gbbl in 2004 (Nield, 2004).

CNPC held Block 6, which is located to the northwest of Muglad. Reserves in Block 6 were reported to be 700 Mbbl. In March 2004, CNPC started production at the Fula Field in Block 6 at a rate of 10,000 bbl/d. Production was expected to rise to 68,000 bbl/d in 2005 and 99,000 bbl/d in 2006 and 2007 (Nield, 2004; Africa Energy Intelligence, 2005a).

Blocks 3 and 7 in eastern Sudan were held by the Petrodar Consortium [CNPC (41%), Petronas (40%), Sudapet (8%), Gulf Petroleum Company of Qatar (6%), and the Al-Thani Group of Sudan (5%)]. The Adar-Yale field near Malakal produced small amounts of crude petroleum that were refined at El Obeid. Blocks 3 and 7 had reserves of 775 Mbbl. CNPC, which was the operating company, expected to produce 170,000 barrels per day (bbl/d) in Blocks 3 and 7 in the second half of 2005. Production could rise to 300,000 bbl/d by the end of 2006 (Nield, 2004).

Blocks 5A and 5B were located in the Muglad Basin. Block 5A was held by a consortium that consisted of Petronas (69%), ONGC Videsh (24%), and Sudapet (7%). Reserves at the Thar Janh field in Block 5A were reported to be 150 Mbbl. Block 5B was held by Petronas (39%), Lundin Petroleum AB of Sweden (24.5%), ONGC Videsh (23.5%), and Sudapet (13%). In 2004, operations in Block 5B remained on hold because of security concerns (Nield, 2004; Lundin Petroleum AB, 2005, p. 3).

In December 2004, Total SA, Marathon Oil Corp., and Kuwait Petroleum Corp. renegotiated their production-sharing agreement with the Government for Block B in southern Sudan. The original agreement was signed in 1983; the companies had suspended their involvement because of civil unrest. At the end of 2004, Total had not set a date for the resumption of exploration (Africa Energy Intelligence, 2005d).

Zafir Company of Pakistan held Block 9 in eastern Sudan. In October 2004, the Government awarded Block 11, which covered the States of Gezira, North Kordofan, Northern, and White Nile to the west of Block 9, to Zafir. In late 2004, the state-owned company PetroSA (Pty) Ltd. of South Africa signed an evaluation pact with the Government for Block 14 in northwestern Sudan. Cliveden Petroleum Company of Great Britain, the Government of Khartoum State, and Sudapet held Block C, which is located to the west of Block 6 in western Sudan. Petronas held Block 8, which is located in eastern Sudan. Cliveden and Zafir sought joint-venture partners to aid the development of their projects (Africa Energy Intelligence, 2005b-d).

At the end of 2004, Block 10 in Gedaraf State, Block 12 in Darfur State, and Blocks 13 and 15 on the Red Sea remained unawarded. The civil war in Darfur prevented the development of Block 12 (Africa Energy Intelligence, 2005d).

In 2004, exports of crude petroleum were $2.96 billion compared with $1.93 billion in 2003 and $1.4 billion in 2002. Crude petroleum accounted for 78% of the value of Sudan's total exports in 2004 and 85% of the growth in total exports from 2002 to 2004 (Bank of Sudan, 2004).

In 2003, Sudan's output of petroleum products increased to nearly 22.8 Mbbl from 22 Mbbl in 2002 (table 1). The Khartoum Oil Refinery, which was operated by CNPC, accounted for 81% of the national petroleum products output in 2003. The refinery had a capacity of 50,000 bbl/d in 2004; CNPC planned to increase capacity to 100,000 bbl/d. The upgrade was expected to cost $340 million. In November 2003, the Government awarded a contract to ONGC Videsh to increase the capacity of the Port Sudan Refinery to 100,000 bbl/d from 25,000 bbl/d. The upgrade was expected to cost $400 million (Clark, 2004). Sudan also had topping plants at Abu Jabra, El Obeid, and Sharjirah that produced mainly heavy fuel oil.

In 2004, exports of petroleum products amounted to $143 million, or nearly 4% of total exports. Imports of petroleum products were $101 million in 2004 compared with nearly $149 million in 2003. Imports of petroleum products accounted for about 2% of Sudan's total imports (Bank of Sudan, 2004).

Infrastructure

In 2003, domestic production of electricity was 3,354 gigawatthours (GWh) compared with 3,094 GWh in 2002. Thermal power stations accounted for 65% of output in 2003, and hydroelectric plants, 35%. Domestic consumption of electricity increased to 2,320 GWh in 2003 from 1,758 GWh in 2002; industrial consumption rose to 513.5 GWh from 343 GWh (Bank of Sudan, undated, p. 49-50).

The 1,540-kilometer (km) pipeline that ran from Block 1A to Port Sudan had a capacity of 280,000 bbl/d; the addition of pumping stations could increase capacity to 450,000 bbl/d. In 2004, CNPC was building a 730-km crude petroleum pipeline from the Fula Field in the Block 6 oilfields to the Khartoum Oil Refinery; the pipeline was expected to be completed by mid-2005. A consortium of Indian companies led by ONGC Videsh was building a 741-km petroleum products pipeline from the Khartoum Oil Refinery to Port Sudan. The pipeline was expected to be completed in September 2005 (Clark, 2004; Nield, 2004).

Outlook

The International Monetary Fund (2005, p. 208) predicted that Sudan's GDP would rise by 8.3% in 2005 and 8.6% in 2006. High rates of GDP growth may lead to increased demand for such local construction materials as cement, gravel, limestone, marble, and sand. With the start of production in Blocks 3, 6, and 7, Sudan's crude petroleum output could rise to as much as 500,000 bbl/d by the end of 2005 and to 650,000 bbl/d by the end of 2006. Plans to increase petroleum production depend upon political stability; the success of the peace agreement between the Government and the SPLA is a key factor. Successful implementation of the peace agreement could lead to the resumption of exploration activity in Block 5B. The separate conflict in Darfur, which contained parts of Blocks C and 12, remained unresolved at the end of 2004 (Nield, 2004; Sudan News Agency, 2004; United Nations Integrated Regional Information Networks, 2004).

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References Cited

Africa Energy Intelligence, 2002, Sudan—U.S. turns the screws: Africa Energy Intelligence, no. 332, October 23-November 6, p. 2.

Africa Energy Intelligence, 2005a, Sudan—Bumper year for CNPC: Africa Energy Intelligence, no. 385, January 19-February 1, p. 5.

Africa Energy Intelligence, 2005b, Sudan—Musharraf to pay a visit: Africa Energy Intelligence, no. 385, January 19-February 1, p. 2.

Africa Energy Intelligence, 2005c, Sudan—PetroSA lands huge field: Africa Energy Intelligence, no. 385, January 19-February 1, p. 5.

Africa Energy Intelligence, 2005d, Sudan to draw the crowd in 2005: Africa Energy Intelligence, no. 384, January 5-18, p. 1.

Bank of Sudan, 2004, Foreign trade statistical digest: Khartoum, Sudan, Bank of Sudan, Fourth quarter, unpaginated.

Bank of Sudan, [undated], The 43rd annual report 2003: Khartoum, Sudan, Bank of Sudan, 143 p.

Clark, Martin, 2004, Pipelines and peace talks: Petroleum Economist, v. 71, no. 2, February, p. 20.

Glasson, Victoria, 2003, Ethiopia takes Africa's galv capacity to 2.28 million tonnes: Metal Bulletin, no. 8812, October 20, p. 27.

Heins, Russell, 2005, Modular recovery plant suits Sudanese gold junior: African Mining, v. 10, no. 1, January/February, p. 4-5.

International Iron and Steel Institute, 2004, Steel statistical yearbook 2004: Brussels, Belgium, International Iron and Steel Institute, 111 p.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Lundin Petroleum AB, 2005, Year end report 2004: Stockholm, Sweden, Lundin Petroleum AB, 25 p.

Nield, Richard, 2004, Sudan—Politics and untapped potential: Middle East Economic Digest, v. 48, no. 28, July 9-15, p. 29-31.

Sudan News Agency, 2004, Sudan to increase oil production to 500,000 barrels per day: Khartoum, Sudan, Sudan News Agency press release, February 29, 1 p.

United Nations Integrated Regional Information Networks, 2004, Nigeria-Sudan—Darfur talks suspended, both sides vow to stop fighting: New York, New York, United Nations Integrated Regional Information Networks press release, December 21, 2 p.

United Nations Integrated Regional Information Networks, 2005, Sudan—Final peace pact to be signed in Nairobi on Sunday: New York, New York, United Nations Integrated Regional Information Networks press release, January 4, 2 p.

U.S. Department of the Treasury, 2000, Treasury applies Sudan sanctions to joint oil venture: Washington, DC, U.S. Department of the Treasury press release, February 16, 1 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Sudan, World Economic Outlook Database, accessed July 28, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

TABLE 1
SUDAN: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2000	2001	2002	2003	2004[e]
Cement, hydraulic	metric tons	145,800	189,500	204,800 [r]	271,900 [r]	280,000
Chromite, mine output, gross weight[3]	do.	28,500 [r]	20,500 [r]	14,000 [r]	37,000 [r]	26,000 [4]
Gold, mine output, Au content[5]	kilograms	5,774	5,417	5,239	5,106 [r]	5,000
Gypsum	metric tons	13,808	2,422	4,540	13,304 [r]	14,000
Marble	cubic meters	NA	15,500	22,000	22,000 [e]	22,000
Petroleum:						
Crude, including lease condensate	thousand 42-gallon barrels	67,152	77,755	87,759	103,400 [r]	118,000
Refinery products:						
Liquefied petroleum gas	do.	1,656	2,493	2,792	2,658 [r]	2,700
Gasoline	do.	6,456	8,228	8,725	9,423 [r]	9,400
Naptha	do.	--	198	303	260 [r]	260
Jet fuel	do.	--	910	1,339	1,236 [r]	1,200
Kerosene	do.	250	230	259	282 [r]	280
Distillate fuel oil	do.	--	6,282	6,599	6,400 [r]	6,400
Residual fuel oil	do.	4,160	1,656	1,991	2,503 [r]	2,500
Total	do.	12,522	19,997	22,008	22,762 [r]	22,700
Salt	metric tons	86,599	77,783	83,340	61,096 [r]	62,000
Silver	kilograms	NA	1,598	3,256	2,844 [r]	2,900
Steel, semimanufactured	metric tons	NA	42,785	53,035	63,936	64,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. NA Not available. -- Zero.

[1]Includes data available through August 16, 2005.

[2]In addition to the commodities listed, the following are presumably produced although available information is inadequate to estimate output: clay and/or shale for cement manufacture (normally about 0.4 metric ton of clay and/or shale per metric ton of finished cement); limestone for cement manufacture (normally at least 1.25 metric tons per metric ton of finished cement), agriculture, lime manufacture, and construction aggregate and fill; other construction materials (clays, sand and gravel, stone, and others for local use); and mica.

[3]Presumed to be ores and concentrates with an estimated average grade of about 54% chromic oxide.

[4]Reported figure.

[5]Does not include artisanal output.

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TABLE 2
SUDAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Atbara Cement Company Ltd. (LaFarge Group of France and Dal Group of Sudan)	Plant at Atbara	400,000.
Do.		Nile Cement Company (Government, 100%)	Plant at Rabak	100,000.
Chromite		Ingessana Hills Mines Corp.	Mine at Ingessana Hills	48,000.
Do.		Elneelain Works Co.	NA	NA.
Gold	kilograms	Compagnie Miniere Or (Government of Sudan, 60%, and Ariab Mining Company Ltd., 40%)	Mine at Ariab	5,000.
Gypsum		Sudanese Mining Corp. (Government, 100%)	Bir Eit Mine	15,000.
Limestone		Atbara Cement Company Ltd.	Mine at Atbara	500,000.
Do.		Nile Cement Company	Mine at Rabak	200,000.
Marble		Makawi's Factory for Marble and Granite	NA	NA.
Do.		Stones & Marbles Co.	NA	NA.
Do.[1]		Al Masarra Co. Ltd.	Mines at Atbara and El Jebelein	NA.
Do.[1]		Imtco Mining Co.	Mine at Synkat	NA.
Mica		Sudanese Mining Corp. (Government, 100%)	Sheriek Mines	1,800.
Petroleum:				
Crude	thousand barrels	Greater Nile Petroleum Operating Co. [China National Petroleum Corp. (CNPC), 40%; Petronas Carigali Overseas Shd. Bhd., 30%; ONGC Videsh Ltd., 25%; Sudan Petroleum Company Ltd. (Sudapet), 5%]	Block 1, El Toor, Tooma South, and Unity Fields; Block 1A, Khairat and Munga Fields; Block 2, Grand Heglig Field (Barki, Hamra, Heglig, Kanga Laloba, Rihan, and Toma Fields); Block 2A, Bamboo and Garaad Fields; Block 4, Diffra Field	120,000.
Do.	do.	Petrodar Consortium (China National Petroleum Corp., 41%; Petronas Carigali Overseas Shd. Bhd., 30%; Sudan Petroleum Company Ltd., 8%; Gulf Petroleum Company of Qatar, 6%; Al-Thani Group, 5%)	Blocks 3 and 7	3,650.
Do.	do.	China National Petroleum Corp.	Block 6 (Fula Field)	3,650.
Refined	do.	Khartoum Oil Refinery (China National Petroleum Corp., 50%, and Sudan Petroleum Corp., 50%)	Refinery at Jali	18,250.
Do.	do.	Port Sudan Refining Ltd. (Government, 100%)	Refinery at Port Sudan	93 liquefied petroleum gas; 1,014 gasoline; 898 kerosene; 2,499 diesel fuel; 4,154 residual fuel oil; 458 naphtha.
Do.	do.	Government	Refinery at El Obeid	3,650.
Do.	do.	Concorp Ltd.	Refinery at Shajirah	3,650.
Do.	do.	Government	Refinery at Abu Jabra	730.
Steel:				
Crude		Sudan Master Technology	Plant at Giad Industrial City	60,000.
Rebar		do.	do.	150,000.
Galvanized		Sudanese Malaysian Co.	NA	8,000.
Do.		Hafez el Barbary	NA	7,000.

NA Not available.
[1]Out of operation since 2001.

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The Mineral Industry of Tanzania

By Thomas R. Yager

In recent years, the mineral industry of Tanzania has produced copper, gold, silver, and rolled steel products, and such industrial minerals as calcite, diamond and other gemstones, gypsum, phosphate rock, and salt. The country has also produced coal, natural gas, petroleum products, and such building materials as cement, gravel, limestone, pozzolanic materials, and sand. Deposits of cobalt, iron ore, nickel, and titanium are also known to occur in Tanzania.

In 2004, Tanzania's nominal gross domestic product (GDP) based on purchasing power parity amounted to $24.7 billion; the per capita GDP was about $700. The real GDP grew by 6.7% in 2004 compared with 7.1% in 2003. Manufacturing accounted for 8.8% of the GDP; construction, 4.6%; mining and quarrying, 3.2%; and electricity and water, 1.6% (Bank of Tanzania, 2004, p. 34; International Monetary Fund, 2005, p. 212; 2005§[1]).

The value of output in the mining sector grew by nearly 16% in 2004 after rising by 18% in 2003. From 1999 to 2004, the value of output in the mining sector grew by an average of 15% per year because of substantial increases in gold production (table 1). During the same period, the value of output in the construction and electricity and water sectors rose by an average of 11% and 4%, respectively (Bank of Tanzania, 2004, p. 36).

Trade

Tanzania's mineral exports have risen substantially since 2000. Most of the increase was attributable to gold exports, which increased in value to $597 million in 2004 from $504 million in 2003 and $121 million in 2000. From 2000 to 2004, gemstone exports increased in value to $26.9 million from $18.5 million and diamond exports fell to $33.7 million from $46 million. Exports of other minerals, which included copper and silver, amounted to $15.9 million in 2004. The share of minerals in total exports was 52% in 2004 (Kafumu, 2005).

The Bank of Tanzania (2004, p. 77) reported that imports of petroleum products rose in value to $416 million in 2004 from $403 million in 2003 and $143 million in 2000. From 2000 to 2004, imports of fertilizers rose in value to $59.4 million from $16.8 million. Petroleum products accounted for nearly 17% of total imports, and fertilizers, 2%.

Commodity Review

Metals

Cobalt, Copper, and Nickel.—The Kahama Mining Corp. Ltd. (KMC) (100% owned by Barrick Gold Corp.) produced copper as a coproduct at the Bulyanhulu gold mine. Copper production increased to 4,133 metric tons (t) in 2004 from a revised 3,715 t in 2003 (table 1). In early 2004, Barrick and Falconbridge Ltd. signed an agreement for the exploration and development of the Kabanga nickel sulfide deposit in northwestern Tanzania. The companies planned drilling and other exploration work at Kabanga and other nearby targets; a feasibility study was expected to be completed by early 2007. Resources at Kabanga were estimated to be 26.4 million metric tons (Mt) at grades of 2.6% nickel, 0.27% copper, and 0.16% cobalt (Tassell, 2004a; Kafumu, 2005).

In January 2004, Albidon Ltd. was awarded the Kitai, the Mbinga, the Mhangaji, the Peramiho, and the Pitu River licenses, which make up the Southwest Tanzania Reconnaissance Project. Albidon planned to spend $1 million during a period of 2 years on exploration for copper, nickel, and platinum group metals (PGM) at these properties. The Kitai, the Mbinga, and the Mhangaji properties are located near Lake Malawi; the Peramiho property, to the east of Songea; and the Pitu River property, between Songea and Njombe. In 2004, Albidon formed a joint venture with WMC Resources Exploration Pty. Ltd. to explore at the Southwest Tanzania Reconnaissance Project (Albidon Ltd., 2004a; 2004b, p. 13, 61-72).

Goldstream Mining NL of Australia explored for cobalt, copper, and nickel at the Mibango Project near Lake Tanganyika and at the Luwumbu Project near Lake Malawi in 2004. The company had joint-venture agreements with Lonmin plc of the United Kingdom for these projects, which included conducting a feasibility study. Exploration work at Mibango focused upon nickel sulfide resources in 2004. According to preliminary data from the company's drilling program, nickel resources at Mibango were estimated to be 89.2 Mt at grades of 1.08% nickel, 0.14% copper, 0.058% cobalt, and 0.45 grams per metric ton (g/t) combined PGM and gold. Goldstream also started exploration work at its new Nachingwea copper-platinum project in southeastern Tanzania and the Morogoro copper-gold-platinum project west of Morogoro (Goldstream Mining NL, 2004, 2005).

Gold.—Tanzania's gold production increased to 51,010 kilograms (kg) in 2004 from 48,018 kg in 2003 and 43,320 kg in 2002. Tanzania became the third ranked gold producer in Africa in 2003. The Buhemba, the Bulyanhulu, the Geita, the Golden Pride, and the North Mara mines had a combined capacity to produce about 56,800 kilograms per year (kg/yr) of gold. Tanzania's resources amounted to nearly 1,500 t of contained gold, of which nearly 780 t was reserves (tables 1, 2, and 3).

Geita Gold Mining Ltd. was a joint venture between AngloGold Ltd. of South Africa and Ashanti Goldfields Co. Ltd. of Ghana. In April 2004, the companies merged to form AngloGold Ashanti Ltd. The Geita open pit gold mine produced about 21,500 kg of gold in 2004 compared with nearly 20,600 kg of gold in 2003; the increase in production was mostly attributable to higher ore grades. Cash costs rose to $250 per troy ounce of gold in 2004 from $183 per troy ounce of gold in 2003 because of higher contractor and diesel costs. In 2005,

[1]References that include a section mark (§) are found in the Internet References Cited section.

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production at Geita was expected to fall to about 19,500 kg at a cash cost of $253 per troy ounce of gold (AngloGold Ashanti Ltd., 2005, p. 45).

AngloGold Ashanti spent $5 million on exploration in Tanzania in 2004, most of which was spent at Geita. The company also had a joint-venture agreement with Tan Range Exploration Corp. of Canada for the Kigosi North property. Exploration activities at Kigosi North were temporarily suspended because of permitting issues (AngloGold Ashanti Ltd., 2005, p. 56).

KMC operated the Bulyanhulu underground gold mine. In 2004, the Bulyanhulu Mine produced nearly 10,900 kg of gold from 1.12 Mt of ore compared with 9,753 kg of gold from 980,000 t of ore in 2003. Recovery rates from 2003 to 2004 remained unchanged at 88%. Cash costs were $270 per troy ounce of gold in 2004 compared with $235 per troy ounce of gold in 2003. Increased ore dilution was more than offset by higher volumes of ore milled (Barrick Gold Corp., 2005, p. 22-23, 44). KMC also produced copper and silver as coproducts. The majority of gold was recovered from copper concentrates; the remainder was from gold doré.

In 2005, Barrick planned to produce about 10,000 kg of gold at Bulyanhulu; cash costs were expected to be between $340 and $350 per troy ounce of gold. The life of the mine was expected to be 24 years; further exploration to increase resources and reserves was planned for 2005 (Barrick Gold Corp., undated§).

Barrick and its joint-venture partner Explorations Minières du Nord Ltée (MDN) of Canada were engaged in the construction of the Tulawaka open pit gold mine; capital costs amounted to $48 million in 2004. Commercial production was expected to start at the mine in March 2005. The Tulawaka Mine was expected to produce 3,400 kg of gold in 2005 at an average cash cost of $207 per troy ounce; recovery rates were expected to be 95%. Reserves in the East Zone of Tulawaka were estimated to be 1.39 Mt at a grade of 12.2 g/t gold. MDN engaged in exploration at the West Zone of Tulawaka and at properties near the mine; the company planned to complete a resource assessment for the West Zone in the first quarter of 2005 (Barrick Gold Corp., 2005, p. 45; Explorations Minières du Nord Ltée, 2005).

Barrick explored for gold at Buzwagi (formerly known as Chocolate Reef) in 2004; the company planned a scoping study and a $5 million exploration program for 2005. Exploration was also planned for Golden Ridge and Nzega West in 2005. Barrick's land holdings in the Lake Victoria Goldfield amounted to about 9,000 square kilometers (km^2) in 2004. The company reportedly acquired licenses that covered 4,600 km^2 in the Lupa Goldfield in southern Tanzania near Mbeya. Barrick was engaged in a joint venture with Mbeya Resources of South Africa for the Lupa properties (Tassell, 2004a; Barrick Gold Corp., 2005, p. 17).

Resolute Mining Ltd. of Australia owned the Golden Pride open pit mine. In 2004, the Golden Pride Mine produced 4,781 kg of gold from 2.88 Mt of ore compared with 5,188 kg of gold from 2.49 Mt in 2003. Gold recovery rates exceeded 94% throughout the year. Lower production was attributable to a decrease in ore grades (Resolute Mining Ltd., 2003; 2004a, b; 2005).

From 2004 to 2008, Resolute planned to produce nearly 5,000 kg/yr of gold at a cash cost of $220 per troy ounce of gold. The company indicated that it expected to have a stockpile of 5 Mt of low-grade ore by 2009. Depending upon the price of gold, production from the stockpile could maintain milling operations for an additional year or two after the cessation of mining in 2008 (Tassell, 2004b).

Resolute explored at Golden Pride and at the Matinje and the Matinje West properties, which are located 30 kilometers (km) to the east of Golden Pride. The company also explored at the Kahama project, where it had a joint-venture agreement with Sub-Sahara Resources NL of Australia. Resolute, which held a 51% interest in Kahama, had the option to increase its share to 70% by contributing an additional $5 million or by completing a feasibility study by the end of 2008. The company also had joint-venture agreements with Sub-Sahara for the Mkweni and the Mwagi Magi South properties. Resolute conducted exploration at the Nyakafuru project, which was a joint venture with Gallery Gold Ltd. of Australia; further exploration was planned for the first quarter of 2005. Nyakafuru had resources of about 3.6 Mt at a grade of 6.3 g/t gold (table 3; Resolute Mining Ltd., 2005).

East African Gold Mines Ltd. (EAGM) started production at the North Mara open pit gold mine during the third quarter of 2002. The North Mara project encompassed the Gokona, the Nyabigena, and the Nyabirama pits. Placer Dome Gold Inc. of Canada purchased North Mara in July 2003. In 2004, Placer Dome produced 6,485 kg of gold from nearly 2.13 Mt of ore. Cash costs increased to $230 per troy ounce of gold from $225 per troy ounce of gold in 2003, and the recovery rate fell to 92% from 93.5%. During the first 5 months of 2003, EAGM produced 2,481 kg of gold from 815,000 t of ore and during the last 5 months of the year, Placer Dome produced 2,785 kg of gold from 869,000 t of ore (Lion Selection Group Ltd., 2003; Placer Dome Gold Inc., 2005, p. 36).

In the fourth quarter of 2004, Placer Dome completed the expansion of its ore treatment capacity to 2.8 Mt/yr from 2 Mt/yr. As a result, production at North Mara was expected to increase to about 9,000 kg in 2005 at a cash cost of $230 per troy ounce of gold (Placer Dome Gold Inc., 2005, p. 32).

In February 2003, the state-owned company Meremeta Ltd. started production at the open pit Buhemba Mine near Musoma. The company's monthly production amounted to between 240 and 250 kg of gold from nearly 100,000 t of ore; production of ore was expected to rise to 110,000 metric tons per month (t/mo) by early 2005. The expected life of the mine was 8 years. Meremeta also held the Kilamongo and the Mwizi deposits south of Buhemba and the Nyasanero deposit. The Buhemba Mine was developed at a cost of $65 million; Meremeta planned additional expenditures for exploratory drilling at Kilamongo and Mwizi (Kafumu, 2004; Tassell, 2004b).

Gallery Gold Ltd. held the Buckreef/Rwamagaza and the Kitongo deposits. The company planned to complete a feasibility study on the Buckreef Project in 2005. If the study were to yield favorable results, Gallery planned to start construction of open pit mines at Buckreef and Busolwa and an underground mine at Buckreef in 2005. Production was expected to start in the second half of 2006. The mines could

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produce a total of between 3,700 and 5,600 kg/yr of gold. Resources at Buckreef and Rwamagaza were 35 t of contained gold (table 3); the project had an estimated life of 7 to 10 years. Gallery also conducted drilling and a resource assessment at Kitongo in 2005; resources were previously estimated to be 17 t of contained gold (Gallery Gold Ltd., 2004).

In 2004, African Eagle Resources plc of the United Kingdom carried out exploration at Miyabi that tripled resources to 8.3 Mt at a grade of 1.5 g/t gold. In 2005, African Eagle planned further exploration at Miyabi to increase resources and at its Dutwa, Gloria, Igurubi, and Msasa properties (African Eagle Resources plc, 2005, p. 6).

Shanta Gold Ltd. held the Mgusu deposit, which had resources of 6.2 Mt at a grade of 3.7 g/t gold (table 3). In August 2004, the company signed a joint-venture agreement with Placer Dome for exploration at the Tarime project near the North Mara Mine.

In 2004, Goldstream Mining was awarded six properties that were prospective for gold. The Morogoro copper-gold-platinum project comprised two properties west of Morogoro; and the Muipa gold project, three properties between the Lupa and the Mpanda goldfields. Exploration started at Morogoro and Muipa in 2004 (Goldstream Mining NL, 2004).

Sub-Sahara signed the Lake Victoria joint-venture agreement with Currie Rose Resources of Canada in 2004. This agreement covered the Jubilee Reef, the Mabale Hills, and the Nyamirembe project areas (Mining Review Africa, 2004).

Tan Range Exploration Corp. of the United States increased its holdings in the Lake Victoria goldfield to 121 prospecting licenses in 2004 from 78 in 2003. The company engaged in exploration at its Kibara, Luhala, and Shinyanga projects in 2004. Tan Range also had joint-venture agreements with Barrick for the Iltemia project, AngloGold Ashanti for the Kigosi project, and MDN for the Biharamulu and the Tulawaka projects (Tan Range Exploration Corp., 2005, p. 5-6, 22-26).

In 2004, Randgold Resources Ltd. signed a joint-venture agreement with Barrick for five of Barrick's properties in the Musoma Mara region. Randgold held an additional 10 licenses near Musoma. Lakota Resources Inc. of Canada commenced drilling on the Ikungu property; the company also explored for gold at the Tembo project (the Bemuda, the Ikina Reefs, and the Tannor properties) near the Bulyanhulu Mine. Midlands Minerals Corp. of Canada explored for gold at its Itilima property in the Lake Victoria goldfield.

Iron and Steel, Titanium, and Vanadium.—National production of rolled steel was 39,556 t in 2004 compared with 39,630 t in 2003 and 11,182 t in 2000. MM Integrated Steel Mills Ltd. remelted scrap steel for use in its rolling mill; the company produced steel bars and pipes. Other rolling mills included Aluminum Africa Ltd. (ALAF) and SITA Steel Rollings Ltd.; ALAF consumed most of its cold-rolled steel production in its galvanizing plant.

In 2003, the Government imposed a ban on exports of scrap aluminum, brass, iron, and steel because shortages of low-cost domestic scrap forced Tanzanian iron and steel producers to import high-cost billet. The Government experienced difficulty in enforcing the ban. In September 2004, the Government banned the export of all scrap metal (Kasumuni, 2004a).

The International Iron and Steel Institute (2004, p. 81, 85) estimated that Tanzania's imports of semimanufactured and finished steel products amounted to 147,000 t in 2003 compared with 134,000 t in 2002 and 60,000 t in 1998. From 1998 to 2003, Tanzania's apparent consumption of crude steel rose to 164,000 t from 67,000 t.

The state-owned National Development Corporation (NDC) planned to develop the Liganga iron ore project. In the first phase of the project, NDC planned to produce 120,000 t/yr of titanium concentrates and 5,000 t/yr of vanadium concentrates, and in the second phase, 500,000 t/yr of iron and steel products. Development of the Liganga project depended on the opening of the Mchuchuma coal mine; the cost of the project was estimated to be $1.14 billion (Spatial Development Initiatives Support Programme, 2003).

Platinum-Group Metals.—In 2004, Goldstream Mining NL explored for PGM at the Mibango project near Lake Tanganyika and at the Luwumbu project near Lake Malawi. According to preliminary data from the company's drilling program, PGM resources at Mibango were estimated to be 9.3 Mt at grades of 1.6 g/t combined PGM and gold, 0.85% nickel, 0.22% copper, and 0.065% cobalt (Goldstream Mining NL, 2004, 2005).

Sub-Sahara signed a joint-venture agreement with Canyon Resources Ltd. of Tanzania in 2004. The Platinum Areas joint venture was an agreement to explore for copper, gold, nickel, and PGM on 12 properties that covered 16,000 km^2 in western Tanzania (Mining Review Africa, 2004). African Eagle and Shanta Gold Ltd. of Tanzania were engaged in a joint venture to explore for PGM at Zanzui in the Lake Victoria goldfield; Shanta withdrew in 2004.

Silver.—Tanzania produced silver as a coproduct of gold mining and refining. Domestic output of silver increased to 12,816 kg in 2004 from 7,986 kg in 2003 (table 1). The Bulyanhulu Mine produced concentrates that contained copper, gold, and silver; the recovery rate for silver was 65%. Contained silver resources at Bulyanhulu were estimated to be 300 t, of which nearly 260 t were reserves (Barrick Gold Corp., 2005, p. 129).

In February 2004, Coeur d'Alene Mines Corp. of the United States was awarded 10 prospecting licenses for gold and silver in the Lake Victoria goldfield. Preliminary exploration work started in 2004; the company planned to spend $300,000 on exploration in 2005.

Industrial Minerals

Cement.—In 2004, Tanzania's cement production increased to 1.28 Mt from nearly 1.19 Mt in 2003 and 833,000 t in 2000 because of demand from gold mine development, infrastructure works, and large construction projects. Tanzania's three cement producers were Mbeya Cement Co. Ltd., Tanga Cement Co. Ltd., and Tanzanian Portland Cement Co. Ltd. (TPCC); these companies used gypsum mined at Makanya in the Mwanga District as raw material.

In August 2004, Tanga Cement suspended exports to Madagascar and Mozambique because of high power and transportation costs. The company was producing at a rate of 250,000 t/yr. At the end of 2004, TPCC was increasing its

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capacity to between 650,000 and 700,000 t/yr from 500,000 t/yr. TPCC produced about 60% of its own clinker and imported most of the remainder; the expansion would enable the company to become self-sufficient in clinker (Kenge, 2003; Ubwani, 2004; EastCoast Energy Corp., 2005, p. 4).

Diamond.—In 2004, national diamond production amounted to 303,920 carats compared with 236,582 carats in 2003 and 239,761 carats in 2002. Diamond exports were $33.7 million in 2004 (Kafumu, 2005). The Williamson Mine, which was operated by DeBeers Group, accounted for a majority of Tanzania's diamond production. Artisanal miners mined alluvial deposits near the Williamson Mine.

Diamond recovery at the Williamson Mine rose to 285,778 carats in 2004 from 166,263 carats in 2003. Ore processed fell to nearly 3.42 Mt in 2004 from 4.54 Mt in 2003. The increase in production was partially attributable to greater efficiency in the production process and unexpectedly improved results from the reprocessing of recovery plant tailings. The capacity of the recovery plant was increased to compensate for technical problems with the high-pressure jig unit (DeBeers Group, 2005, p. 44, 50). The entire output of the mine was exported to the United Kingdom.

In January 2004, El Hillal Minerals Ltd. of Tanzania started pilot mining at Mwadui near the Williamson Mine; the new mine would be the second ranked diamond mine in Tanzania. The company planned to produce from 18,000 to 24,000 carats per year. El Hillal exported about 2,700 carats of diamond in 2004.

Sola Resources Corp. of Canada and Frontier Resources Ltd. of Tanzania were engaged in a joint venture to explore for diamond at the Eagle property near the Williamson Mine. In December 2004, Sola and Frontier reported that the Eagle One kimberlite was diamondiferous. The companies planned further exploration, including indicator mineral studies and geophysical surveys, followed by trenching and bulk sampling (Sola Resources Corp., 2004).

Tan Range signed an option agreement for prospecting licenses northwest of Mwadui; the company planned to explore for diamond in late 2004 and 2005 (Tan Range Exploration Corp., 2005, p. 7). Midlands Minerals Corp. of Canada explored for diamond at its Itilima property in the Lake Victoria goldfield.

Gemstones.—In 2004, the total production of gemstones rose to 1,610,000 kg from 1,530,000 kg in 2003 and 196,000 kg in 2002. The value of gemstone exports rose to $26.9 million in 2004 from $19.1 million in 2003 (Kafumu, 2005). Lower production of tanzanite was more than offset by rising tanzanite prices and increased production of other gemstones.

Merelani, which is near Arusha, was the world's only source of tanzanite. From 2001 to 2003, tanzanite accounted for 80% of the value of domestic gemstone production. In late 2003 and early 2004, tanzanite prices increased sharply because of decreases in production. The increasing depths of tanzanite mines led to higher production costs and a need for greater investment in equipment. Lower grades of tanzanite exacerbated these problems (Colored Stone, 2004b; S. S. Salim, Ministry of Energy and Minerals, written commun., September 17, 2002; Zacharia Makka, Commissioner for Minerals, Ministry of Energy and Minerals, written commun., October 28, 2004).

In Blocks B and D of the Merelani deposit, as many as 10,000 miners working in small-scale mines accounted for most of the country's tanzanite production. Tanzanite Africa Ltd. (a subsidiary of IPP Ltd. of Tanzania) operated larger-scale mines in Blocks B and D. Kilimanjaro Mines Ltd. mined tanzanite in Block A (Henricus, 2003).

African Gem Resources Ltd. (Afgem) of South Africa held the rights to mine for tanzanite in Block C; the company started commercial-scale production during the first quarter of 2003. Afgem cut high-quality tanzanite at its lapidaries in South Africa and Tanzania. In May 2004, Afgem was purchased by TanzaniteOne Ltd.

During the last 7 months of 2004, TanzaniteOne produced 197 kg of tanzanite. The company's processing plant had a capacity of 10,000 t/mo; the plant operated at 20% of capacity in late 2004 because mining was restricted by shaft development. TanzaniteOne planned to increase production and complete upgrades to its mine shafts by late 2005. The company also planned an exploration program to increase the 12-year life of its mine to 20 years. Exploration for tanzanite at greater depths on Block C and on adjacent properties was expected to start in the first half of 2005. Resources in Block C were estimated to be between 12,600 kg and 16,600 kg of contained tanzanite in from 950,000 t to 1.26 Mt of ore (TanzaniteOne Ltd., 2004; 2005a, p. 1, 8; 2005b, p. 31).

More than 98% of the gemstones exported from Tanzania were shipped in rough form to foreign cutting and polishing centers. India accounted for about 80% of the world's cutting and polishing of tanzanite. In July 2003, a ban was proposed on the export of all rough tanzanite by the end of 2005. This proposal was designed to encourage the growth of the Tanzanian lapidary industry. At the end of 2004, the Parliament of Tanzania had not taken action on the proposed ban. In August 2004, the Parliament increased the export tax on rough gemstones to 5% from 3% and eliminated the export tax on cut tanzanite. Additionally, the Parliament established a Gemstone Board to offer advice on the development of the lapidary industry. Licenses for dealing in gemstones were required to be accompanied by a statement indicating the capacity to engage in gemstone cutting (Kafumu, 2004; TanzaniteOne Ltd., 2004; Kondo, 2005).

Tsavorite, which is a green grossular garnet that obtains its color from trace amounts of chromium and vanadium, was mined near Merelani and Mtwara. Tanzania's production of tsavorite increased in early 2004. Domestic production of hessonite garnet also increased in 2004. Hessonite is an orange grossular garnet that obtains its color from trace amounts of iron and manganese. About 6% of the material was of high quality and a good orange color (Colored Stone, 2004a). Rhodolite garnet was mined in the Tunduru District and the Umba Valley in the Tanga Region, and red garnet was found at Mwazye and Ng'ongo in the Sumbawanga District.

In recent years, ruby has been produced at the Longido Mine (Monduli District), the Losongonoi Mines (southeast of Arusha), the Naende Mines (Rukwa Region), in the Songea and the Tunduru Districts (Ruvuma Region), and in the Umba

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Valley. Sapphire was produced in the Songea and the Tunduru Districts and in the Umba Valley.

Alexandrite was produced in the Manyara Region and in the Tunduru District; aquamarine was mined at Kalunga in the Nkasi District; emerald, in the Manyara Region and in the Sumbawanga District; spinel, in the Mahenge Region in south-central Tanzania and in the Tunduru District; and tourmaline, in the Naende ruby mines (Rukwa Region), in the Sumbawanga District, and in the Umba Valley.

Lime.—Athi River Mining Ltd. (ARM) of Kenya operated a lime plant at Tanga with a capacity of 20,000 t/yr. The company produced lime for use in Tanzania's gold mining industry and planned to export some of its production to countries in the Common Market for Eastern and Southern Africa (COMESA) and the South African Development Community (Nation, 2004).

Silica.—Deposits of silica sand were found near Dar es Salaam and Bukoba, which was a port on Lake Victoria. Kioo Ltd. operated a glass plant in Dar es Salaam with a capacity of 36,000 t/yr. The company planned to increase its capacity to 50,000 t/yr in 2006; the expansion was expected to cost $29 million. Kioo's export markets were limited by Tanzania's lack of membership in COMESA; nonmember countries were subject to tariffs of 50% to 52% (Gumbo, 2004).

Mineral Fuels

Coal.—The Kiriwa coalfield produced small amounts of bituminous coal, most of which were consumed at a powerplant near the mine. Bituminous coal deposits in the Ruhuhu coalfield included the Ketewaka, the Mbalawala, the Mbuyura, and the Mchuchuma; other bituminous coalfields included the Gahula and the Njuga. In 2004, Tanzania's coal production was increased to 65,041 t from 54,610 t in 2003 in response to higher coal demand from Mbeya Cement.

The state-owned National Development Corp. (NDC) formed a joint venture with Grinaker-LTA and Siemens Ltd. to develop the Mchuchuma coal deposit. In the first phase of the project, the NDC planned to build a surface mine with a capacity of 1.5 Mt/yr and a coal-fired powerplant with a capacity of 400 megawatts (MW). In the second phase, coal production would rise to 3 Mt/yr, and in the third phase, to between 8 and 10 Mt/yr. The mine was expected to be commissioned in 2008; development was likely to start in early 2006. Costs for the project were estimated to be $612 million; development depended upon Government approval of the project verification documents submitted in March 2004 and financial support from the World Bank Group (Spatial Development Initiatives Support Programme, 2003; Kasumuni, 2004b).

Natural Gas.—In July 2004, EastCoast Energy Corp. started the production of natural gas from Songo Songo Island. At the end of August, EastCoast was spun off by parent company PanOcean Energy Corp. Ltd. Production amounted to 119 million cubic meters of natural gas in 2004. The Ubungo power station in Dar es Salaam consumed 105 million cubic meters of Songo Songo's production, and the Wazo Hill cement plant operated by TPCC, 11 million cubic meters. Reserves at Songo Songo were estimated to be 10 billion cubic meters at the end of 2004 (EastCoast Energy Corp., 2005, p. 3, 7).

Starting in 2005, EastCoast planned to produce nearly 380 million cubic meters per year of natural gas. The Ubungo power station was likely to consume more than 290 million cubic meters per year, and the Wazo Hill cement plant, 45 million cubic meters per year. In September 2004, Kioo Ltd. and Tanzania Breweries Ltd. started purchasing gas from EastCoast; these companies were expected to consume an average of more than 14 million cubic meters per year. By the second quarter of 2005, ALAF and four other companies that signed contracts to purchase natural gas were expected to consume at the rate of more than 13 million cubic meters per year. Following the construction of a 9-km pipeline in the third quarter of 2005, Karibu Textile Mills Ltd. planned to consume an average of 8.3 million cubic meters per year (EastCoast Energy Corp., 2005, p. 9).

In May 2004, Artumas Group Inc. of Canada signed a production-sharing agreement (PSA) with the Government for development of the Mtwara Energy Project. This project involved the development of natural gas resources in Mnazi Bay in southeastern Tanzania, the construction of a 27-km pipeline, the installation of a 30-MW powerplant, and the upgrading of the local power transmission and distribution system. Capital costs were estimated to be $97 million. Development of the Mtwara Energy Project started in December; construction was expected to start in July 2005. Production of natural gas for use in the power station was expected to begin in the first quarter of 2006, and the production of liquefied natural gas, in the fourth quarter of 2008. Mnazi Bay had estimated resources of between 2.1 billion and 6.1 billion cubic meters (Spatial Development Initiatives Support Programme, 2003; Artumas Group Inc., 2005, p. 8, 10-11).

Petroleum.—Tanzania's only refinery was shut down because of its outdated technology and high transportation costs; thereafter, the country has depended upon imported petroleum products to meet its petroleum requirements. In 2004, the joint venture of Aminex plc of Ireland, Bounty Oil and Gas NL of Australia, and Petrom SA of Romania drilled the Nyuni-1 exploration well on its Nyuni offshore field concessions. The companies planned further exploration on the license. Petrobras Group of Brazil was awarded an exploration license for Block 5 in the Mafia Basin. Maurel et Prom of France also negotiated a PSA with the Government for an area near the Nyuni License (Africa Energy Intelligence, 2004b; Aminex plc, 2004).

In 2003, Royal Dutch/Shell Group acquired four offshore blocks to the west of Pemba and Zanzibar. As of early November 2004, the Governments of Pemba and Zanzibar were blocking the signing of PSAs on these blocks because of a dispute with the national Government. Antrim Energy Ltd. of Canada held the Pemba-Zanzibar offshore block; the company's exploration activities were also on hold because of this dispute. In late November, the Government planned to launch a licensing round for Blocks 1, 2, 3, and 4 to the north of the block acquired by Petrobras and Blocks 6, 7, and 8, which extended to the border with Mozambique. These plans may be delayed because the Petroleum Act covered exploration only on the continental shelf (Africa Energy Intelligence, 2004a).

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Infrastructure

The state-owned utility Tanzania Electric Supply Company Ltd. (TANESCO) had powerplants with a combined capacity of 794 MW in its grid network, of which 557 MW was hydroelectric and 237 MW was thermal. Hydroelectric power stations included Kidatu, with a capacity of 200 MW; Kihansi, 180 MW; Mtera, 80 MW; Pangani Falls, 68 MW; Hale, 21 MW; and others, 8 MW. The Ubungo thermal plant had a capacity of 112 MW; Tegeta, 100 MW; and others, 25 MW. The Tegeta plant, which used heavy fuel oil, was owned and operated by Independent Power Tanzania Ltd.; the Government planned to convert Tegeta to a gas-fired plant in 2005. The Ubungo plant was converted from jet fuel to natural gas in July 2004 and reached full capacity in October. Capacity at Ubungo was expected to increase to 185 MW in the third quarter of 2005 (World Bank Group, 2004a, p. 8; EastCoast Energy Corp., 2005, p. 10, 13).

In addition to the plants in the grid network, isolated mini-hydroelectric generators supplied small amounts of output. At the Buhemba Mine, the isolated diesel powerplant had a capacity of 7 MW; demand was 4.5 MW of capacity. The Golden Pride and North Mara Mines had powerplants with capacities of 13 MW and 12 MW, respectively (Tassell, 2004a-c).

Tanzania's production of electricity rose to 3,067 gigawatthours (GWh) in 2003 from 2,801 GWh in 2002. The share of hydroelectric power, however, fell to 83% from 97% because of widespread droughts. The continuation of droughts into 2004 led to further hydroelectric production cuts at the Kidatu and the Mtera plants and forced TANESCO to purchase higher-cost electricity from the Tegeta and the Ubungo plants. In June 2004, the World Bank Group approved a loan of $43.8 million to assist the Government in meeting domestic power requirements (World Bank Group, 2004a, p. 6, 7; 2004b).

In 2005, TANESCO was expected to continue to rely on thermal power stations because of the low water level in the Mtera reservoir. Thermal plants were expected to account for 51% of power generated in 2005, and hydroelectric plants, 49% (World Bank Group, 2004a, p. 7, 10).

TANESCO estimated that the consumption of electricity would increase by at least 7.5% per year from 2004 to 2008, and by at least 7.2% from 2009 to 2013. By 2027, peak demand would rise to 2,095 MW of capacity from 506 MW in 2003. The capacity of the Mchuchuma coal-fired powerplant was expected to be 200 MW at its commissioning in 2008, 300 MW in 2010, and 400 MW in 2012. Further expansion at Mchuchuma was planned for 2020. Other new power stations included the Ruhudji hydropower station, which was expected to be commissioned in 2025. TANESCO also planned to import as much as 200 MW from Zambia starting in 2023, and to develop geothermal and other renewable energy sources (Tuson, 2004).

Geothermal areas in Tanzania include Lake Eyasi, Lake Manyara, Lake Natron, Mbeya, Musoma, Ngorongoro Crater, and Rufiji. Resources of geothermal energy at Rufiji were estimated to be more than 100 MW, and at Mbeya, more than 50 MW. The Government planned to produce 5% of Tanzania's electricity requirements by 2010; the cost of geothermal projects with a capacity of 55 MW was estimated to be about $138 million. Most exploration for geothermal energy sources has been very preliminary because of abundant hydropower and plans to develop domestic coal and natural gas resources (Mwihava and others, 2003, p. 8-9).

About 10% of Tanzania's population had access to electricity; most rural energy requirements were supplied by firewood. National wood fuel consumption was estimated to be nearly 45 million cubic meters per year in 2003. Rural firewood consumption accounted for about 56%; urban charcoal consumption, about 40%; and brick and salt production, about 1% each. Small-scale brick producers consumed about 1 cubic meter of firewood for every 1,000 bricks produced. Small-scale salt producers were estimated to consume about 20 kg of firewood for every 1 kg of salt produced. To alleviate the environmental problems from deforestation, TANESCO promoted rural electrification (World Bank Group, 2004b; SADC Programme for Biomass Energy Conservation, 2005, p. 9, 11-12).

Tanzania had about 85,000 km of roads, of which approximately 4,000 km was paved. The rail network covered about 3,600 km. The country had 982 km of crude petroleum pipelines and 246 km of natural gas pipelines. Lake Nyasa, Lake Tanganyika, and Lake Victoria were the principal waterways. Ports and harbors were Bukoba, Dar es Salaam, Kigoma, Kilwa Masoko, Lindi, Mtwara, Mwanza, Pangani, Tanga, Wete, and Zanzibar.

Outlook

Tanzania's mineral industry, particularly gold mining, is likely to grow in the near future. With increased production from the North Mara Mine and the development of such projects as Buckreef and Tulawaka, Tanzania's gold production is expected to rise to about 55 t in 2005, and 59 t in 2007. Artisanal tanzanite production is likely to fall because of resource depletion; it is unclear to what extent increased production by TanzaniteOne will offset the decline. The development of nickel and PGM resources depend heavily upon world market conditions. The International Monetary Fund (2005, p. 208) predicted that Tanzania's GDP would grow by 6.5% in 2005 and 7% in 2006. If similar rates of growth happen in the construction industry, the production of construction materials such as brick clay, gypsum, limestone, and sand and gravel could increase substantially.

References Cited

Africa Energy Intelligence, 2004a, Tanzania—Obstacle course in ultra deep: Africa Energy Intelligence, no. 379, October 20-November 2, p. 3.

Africa Energy Intelligence, 2004b, Tanzania—Second license on Mafia: Africa Energy Intelligence, no. 372, June 23-July 6, p. 5.

African Eagle Resources plc, 2005, Annual report 2004: London, United Kingdom, African Eagle Resources plc, 26 p.

Albidon Ltd., 2004a, Albidon and WMC Resources Exploration cooperation agreement on projects in Africa: Nedlands, Australia, Albidon Ltd. press release, 4 p.

Albidon Ltd., 2004b, Prospectus and AIM Admission Document: Nedlands, Australia, Albidon Ltd., 131 p.

Aminex plc, 2004, Tanzania update: London, United Kingdom, Aminex plc press release, July 16, 1 p.

Digitized by Google

AngloGold Ashanti Ltd., 2005, Annual report 2004: Johannesburg, South Africa, AngloGold Ashanti Ltd., 188 p.
Artumas Group Inc., 2005, Annual report 2004: Calgary, Alberta, Canada, Artumas Group Inc., 56 p.
Bank of Tanzania, 2004, Economic bulletin for the quarter ending December 2004: Bank of Tanzania, v. 35, no. 4, 100 p.
Barrick Gold Corp., 2005, Annual report 2004: Toronto, Ontario, Canada, Barrick Gold Corp., 136 p.
Colored Stone, 2004a, Orange garnet options expand: Colored Stone, v. 17, no. 5, September/October, p. 43.
Colored Stone, 2004b, Tanzanite prices still rising: Colored Stone, v. 17, no. 3, May/June, p. 52.
DeBeers Group, 2005, Annual review 2004: Johannesburg, South Africa, DeBeers Group, 64 p.
EastCoast Energy Corp., 2005, EastCoast Energy announces results to 31 December 2004 and reports a 101% increase in the gross proven recoverable natural gas reserves in Tanzania: Road Town, British Virgin Islands, EastCoast Energy Ltd., April 21, 36 p.
Explorations Minières du Nord Ltée, 2005, Tulawaka gold mine 2005 outlook: Montreal, Quebec, Canada, Explorations Minières du Nord Ltée press release, March 10, 1 p.
Gallery Gold Ltd., 2004, Gallery's Buckreef strategy takes shape: West Perth, Australia, Gallery Gold Ltd. press release, September 14, 5 p.
Goldstream Mining NL, 2004, Report for the quarter ended 31 December 2003: West Perth, Australia, Goldstream Mining NL, 10 p.
Goldstream Mining NL, 2005, Report for the quarter ended 31 December 2004: West Perth, Australia, Goldstream Mining NL, 7 p.
Gumbo, Perege, 2004, Have businessmen suffered from COMESA pull out?: Guardian [Dar es Salaam, Tanzania], October 11, 3 p.
Henricus, Jennifer, 2003, Fresh supply likely to boost tanzanite sales in 2003: Jewellery News Asia, no. 221, January, p. 38, 40.
International Iron and Steel Institute, 2004, Steel statistical yearbook 2004: Brussels, Belgium, International Iron and Steel Institute, 111 p.
International Monetary Fund, 2005, World economic outlook—Building institutions: Washington, DC, International Monetary Fund, September, 293 p.
Kafumu, Peter, 2004, Tanzania—Six new mines in six years: Mining Journal, June 4, p. 18-20.
Kafumu, Peter, 2005, Golden returns for Tanzania: Mining Magazine, v. 193, no. 2, August, p. 28-30.
Kasumuni, Ludger, 2004a, Govt bans scrap metal exports: Guardian [Dar es Salaam, Tanzania], September 4, 1 p.
Kasumuni, Ludger, 2004b, Mchuchuma power investors to plough in $612m: Guardian [Dar es Salaam, Tanzania], March 23, 2 p.
Kenge, Abduel, 2003, New production line likely to boost TPCC output: Express [Dar es Salaam, Tanzania], April 10-16, 1 p.
Kondo, Hamza, 2005, Tanzanite ban plan stalled: Colored Stone, v. 18, no. 1, January/February, p. 40.
Lion Selection Group Ltd., 2003, EAGM—Report to shareholders—North Mara gold project 30th June 2003: Melbourne, Australia, Lion Selection Group Ltd. press release, July 2, 2 p.
Mining Review Africa, 2004, New Tanzanian deals for Sub-Sahara Resources: Mining Review Africa, no. 6, p. 5.
Mwihava, N.C.X., Mbise, H.A., Mnzava, L., and Kibakaya, G., 2003, Draft country study research report—Tanzania: Nairobi, Kenya, African Energy Policy Research Network, 31 p.
Nation, 2004, Cement firm's profits up by 69 per cent [sic]: Nation [Nairobi, Kenya], March 31, 2 p.
Placer Dome Gold Inc., 2005, 2004 annual report: Vancouver, British Columbia, Canada, Placer Dome Gold Inc., 92 p.
Resolute Mining Ltd., 2003, Report on activities for the quarter to 30 June 2003: Perth, Australia, Resolute Mining Ltd., 8 p.
Resolute Mining Ltd., 2004a, Report on activities for the quarter to 31 December 2003: Perth, Australia, Resolute Mining Ltd., 8 p.
Resolute Mining Ltd., 2004b, Report on activities for the quarter to 30 June 2004: Perth, Australia, Resolute Mining Ltd., 7 p.
Resolute Mining Ltd., 2005, Report on activities for the quarter to 31 December 2004: Perth, Australia, Resolute Mining Ltd., 11 p.
SADC Programme for Biomass Energy Conservation, 2005, Baseline study on biomass energy conservation in Tanzania: Pretoria, South Africa, SADC Programme for Biomass Energy Conservation, 46 p.
Sola Resources Corp., 2004, Diamondiferous kimberlite discovered in Northern Tanzania: Calgary, Alberta, Canada, Sola Resources Corp., 2 p.
Spatial Development Initiatives Support Programme, 2003, Mtwara Development Corridor: Johannesburg, South Africa, Spatial Development Initiatives Support Programme, 4 p.
Tan Range Exploration Corp., 2005, 2004 annual report: Sharon, Connecticut, Tan Range Exploration Corp., 32 p.
TanzaniteOne Ltd., 2004, Admission to trading on the Alternative Investment Market of the London Stock Exchange and £5 million placing: Johannesburg, South Africa, TanzaniteOne Ltd. press release, August 20, 4 p.
TanzaniteOne Ltd., 2005a, Chief executive's message: Johannesburg, South Africa, TanzaniteOne Ltd., 24 p.
TanzaniteOne Ltd., 2005b, TanzaniteOne Group Limited Financial Statements 2004: Johannesburg, South Africa, TanzaniteOne Ltd., 48 p.
Tassell, Arthur, 2004a, A "mining miracle" in Tanzania: African Mining, v. 9, no. 2, March-April, p. 30-38.
Tassell, Arthur, 2004b, Buhemba quietly comes on stream: African Mining, v. 9, no. 2, March-April, p. 40-44.
Tassell, Arthur, 2004c, Golden Pride—The mine that started Tanzania's gold boom: African Mining, v. 9, no. 2, March-April, p. 46-51.
Tuson, Paul, 2004, Tanzania—25-year power plan charts the way forward: African Energy, v. 6, no. 6, November/December, p. 8-11.
Ubwani, Zephania, 2004, Tanga Cement suspends exports to Mozambique, Madagascar: Guardian [Dar es Salaam, Tanzania], August 17, 2 p.
World Bank Group, 2004a, Tanzania—Emergency power supply project—Technical annex: Washington, DC, World Bank Group, Report T-7623-TA, May 14, 36 p.
World Bank Group, 2004b, Tanzania obtains credit for emergency power supply: Washington, DC, World Bank Group news release 2004/403/AFR, June 8, 1 p.

Internet References Cited

Barrick Gold Corp., [undated], Global operations—Africa—Bulyanhulu, accessed December 16, 2005, at URL http://www.barrick.com/index.aspx?usesid=-1&sid=69.
International Monetary Fund, 2005 (April), Tanzania, World Economic Outlook Database, accessed December 16, 2005, via http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

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TABLE 1
TANZANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
Calcite[e]		40	40	40	40	40
Cement, hydraulic	thousand metric tons	833	900	1,026	1,186	1,281
Coal, bituminous		79,184	77,789	79,210	54,610	65,041
Copper, contained in concentrates and doré		--	2,645	4,191 r	3,715 r	4,133
Diamond[3]	carats	354,388	254,271	239,761	236,582	303,920
Gemstones, excluding diamond:[4]						
Amethyst[e]	kilograms	239 [5]	277 [5]	270	270	280
Aquamarine	do.	205	454	600 e	278	290 e
Cordierite (iolite)[e]	do.	158 [5]	312 [5]	310	310	330
Garnet	do.	14,940	19,508	13,000 e	5,911	6,200 e
Ruby	do.	1,070	1,174	1,800 e	2,675	2,800 e
Sapphire	do.	2,531	3,576	2,400 e	1,338	1,400 e
Tanzanite	do.	5,516	5,473	6,461	4,490	2,300 e
Other[e]	do.	126,141 [5]	66,092 [5]	171,000	1,520,000	1,600,000
Total	do.	150,800	96,866	196,000	1,530,000	1,610,000
Gold	do.	15,060	30,088	43,320	48,018	51,010
Gypsum and anhydrite, crude		60,000	72,000	73,000	33,232 r	59,200
Natural gas	million cubic meters	--	--	--	--	119
Petroleum products		177,000	--	--	--	--
Phosphate minerals:						
Apatite		5,100	4,000	1,182	3,738	6,570
P_2O_5 content		1,500	1,200	350	1,100	1,900
Salt, all types		70,000	65,000	71,200	58,978	57,061
Silver, contained in concentrates and doré	kilograms	1,384	6,861	7,669	7,986	12,816
Steel, semimanufactured		11,182	16,340	25,418	39,630 r	39,556
Stone, sand, and gravel:						
Aggregates		NA	NA	20,223	107,960	120,000 e
Dolomite		NA	NA	NA	2,197	2,500 e
Limestone, crushed		1,500,000	2,269,359	2,856,711	1,206,000 r	1,391,000
Pozzolanic materials		57,014	41,468	52,000	105,910 r	152,679
Sand		NA	NA	503,485	2,035,960	2,400,000 e

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. NA Not available. [r]Revised. -- Zero.

[1]Includes data available through October 31, 2005.

[2]In addition to the commodities listed, modest quantities of lime, silica sand, and crude construction materials, including brick clay, are produced, but information is insufficient to estimate production.

[3]Diamond figures are estimated to represent 85% gem-quality or semigem-quality and 15% industrial-quality stones. Does not include smuggled artisanal production.

[4]Other precious and semiprecious stones produced include alexandrite, chrysoprase, emerald, kyanite, moonstone, opal, peridot, quartz, spinel, and tourmaline. Does not include smuggled artisanal production.

[5]Reported figure.

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TABLE 2
TANZANIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Tanzania Portland Cement Co. Ltd. (HeidelbergCement, 41%)	Plant at Wazo Hill	500,000 cement; 800,000 clinker.
Do.		Tanga Cement Co. Ltd. (Holcim Ltd., 60%, and Saruji Corp., 40%)	Plant at Tanga	500,000 cement; 500,000 clinker.
Do.		Mbeya Cement Co. Ltd. (LaFarge Group, 58%).	Plant at Mbeya	250,000 cement; 250,000 clinker.
Coal, bituminous		Tanzania-China Kiwira Coal and Power (Hunan International Economic and Technical Cooperation Co., 62%, and Government, 38%)	Kiwira Mine	150,000 run of mine; 93,000 washed.
Copper, in concentrates and doré		Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%).	Bulyanhulu Mine near Kahama	5,300.
Diamond		Williamson Diamonds Ltd. (DeBeers Group, 75%, and Government, 25%)	Mwadui Mine near Shinyanga	7,060,000 ore processing.
Do.	carats	do.	do.	300,000 diamond.
Do.	do.	El Hillal Minerals Ltd.	Near Mwadui Mine	24,000.[e]
Glass		Kioo Ltd.	Dar es Salaam	36,000.
Gold		Geita Gold Mining Ltd. (AngloGold Ashanti Ltd., 100%)	Geita Mine near Nyakabale	6,000,000 ore processing.
Do.	kilograms	do.	do.	24,000 gold.
Do.		Kahama Mining Corp. Ltd.	Bulyanhulu Mine near Kahama	1,095,000 ore processing.
Do.	kilograms	do.	do.	15,100 gold.
Do.		Placer Dome Gold Inc.	North Mara Mine in Tarime District	2,800,000 ore processing.
Do.	kilograms	do.	do.	10,000 gold.
Do.		Resolute Mining Ltd.	Golden Pride Mine near Isanga	2,600,000 ore processing.
Do.	kilograms	do.	do.	4,400 gold.
Do.		Meremeta Ltd. (Government of Tanzania)	Buhemba Mine 47 km southeast of Musoma	1,200,000 ore processing.
Do.	kilograms	do.	do.	3,300 gold.
Lime		Athi River Mining Ltd.	Plant at Tanga	20,000.
Natural gas	million cubic meters	EastCoast Energy Corp.	Gasfield on Songo Songo Island	720.
Petroleum products[1]	thousand 42-gallon barrels	Tanzanian and Italian Petoleum Refining Co. Ltd.	Refinery at Dar es Salaam	5,440.
Phosphate rock		Minjingu Phosphate Co. Ltd.	Mine at Minjingu	30,000.
Silver	kilograms	Kahama Mining Corp. Ltd.	Bulyanhulu Mine near Kahama	12,000.
Steel		SITA Rollings Ltd.	Plant at Dar es Salaam	14,000 rolled.
Do.		MM Integrated Steel Mills Ltd.	do.	2,000 rolled.
Do.		Aluminum Africa Ltd.	do.	40,000 galvanized.
Do.		MM Integrated Steel Mills Ltd.	do.	36,000 galvanized.
Tanzanite		TanzaniteOne Ltd.	Mine at Merelani, Block C[2]	120,000 ore processing.
Do.	kilograms	do.	do.	1,600 tanzanite.
Do.	do.	Tanzanite Africa Ltd. (IPP Media Ltd.)	Mine at Merelani	NA.
Do.	do.	Kilimanjaro Mines Ltd.	Mine at Merelani, Block A	NA.
Do.	do.	Small-scale and artisanal miners	Mines at Merelani, Blocks B and D	NA.

[e]Estimated. NA Not available.
[1]Shut down in 2000.
[2]Formerly the graphite processing plant at Merelani operated by Phoenix Minerals Ltd.

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TABLE 3
TANZANIA: GOLD RESOURCES AND RESERVES IN 2004

Project	Major operating companies	Tonnage (million metric tons)	Grade (grams per metric ton)	Contained gold (metric tons)
Reserves:				
Bulyanhulu[1]	Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%)	23.9	13.8	330
Geita[2]	Geita Gold Mining Ltd. (AngloGold Ashanti Ltd., 100%)	70.6	4.0	281
North Mara[2]	Placer Dome Gold Inc.	34.1	3.6	122
Golden Pride[2]	Resolute Mining Ltd.	14.9	1.7	25
Tulawaka[1]	Barrick Gold Corp., 70%, and Exploration Minières du Nord Ltée, 30%	1.4	12.2	17
Total		144.9	5.3	775
Resources:				
Geita	Geita Gold Mines	169.8	3.3	564
Bulyanhulu	Kahama Mining Corp. Ltd.	28.2	14.5 [3]	408
North Mara	Placer Dome Gold Inc.	48.8	3.3	158
Golden Ridge	Kahama Mining Corp. Ltd.	49.0	1.4	68
Buzwagi[4]	do.	27.9	2.3	64
Golden Pride	Resolute Mining Ltd.	28.5	1.8	51
Buhemba	Meremeta Ltd. (Government of Tanzania)	11.4	2.0	23
Mgusu	Shanta Gold Ltd.	6.2	3.7	23
Nyakafuru	Gallery Gold Ltd.	3.6	6.3	23
Tulawaka	Barrick Gold Corp., 70%, and Exploration Minières du Nord Ltée, 30%	1.9	11.3	21
Buckreef/Rwamagaza:				
Buckreef	Gallery Gold Ltd.	4.7	4.1	19
Busolwa	do.	3.5	2.5	9
Rwamagaza Reefs	do.	0.6	6.7	4
Bingwa and Tembo	do.	0.2	13.7	3
Kitongo:				
Main Zone	do.	10.5	1.4	15
Isegenghe Hill	do.	0.2	14.4	2
Miyabi	African Eagle Resources plc	8.3	1.5	13
Kisunge Hill	Tan Range Exploration Corp.	9.4	1.0	9
Ikungu	Lakota Resources Inc.	2.5	2.3	6
Total		415	3.6	1,480

[1]Definitions of resources and reserves are based on National Instrument 43-101, as required by Canadian securities regulatory authorities.
[2]Definitions of resources and reserves are based on the Australasian Code for the Reporting of Identified Mineral Resources and Ore Reserves issued by the Joint Committee for the Australasian Institute of Geoscientists and the Australian Mining Industry Council.
[3]Note that, in most cases, the grade of resources is lower than the grade for reserves, but in this case, the grade of the less economic material is higher, leading to the paradox of a higher resource grade.
[4]Formerly known as Chocolate Reef.

Sources:

African Eagle Resources plc, 2005, Annual report 2004: London, United Kingdom, African Eagle Resources plc, 26 p.
AngloGold Ashanti Ltd., 2005, Annual report 2004: Johannesburg, South Africa, AngloGold Ashanti Ltd., 188 p.
Barrick Gold Corp., 2005, Annual report 2004: Toronto, Ontario, Canada, Barrick Gold Corp., 136 p.
Explorations Minières du Nord Ltée, 2005, Tulawaka gold mine 2005 outlook: Montreal, Quebec, Canada, Explorations Minières du Nord Ltée press release, March 10, 1 p.
Gallery Gold Ltd., 2004, Gallery's Buckreef strategy takes shape: West Perth, Australia, Gallery Gold Ltd. press release, September 14, 5 p.
Mano River Resources Inc., 2004, Executive presentation—January 2004: Vancouver, British Columbia, Canada, Mano River Resources Inc., 60 p.
Placer Dome Gold Inc., 2005, 2004 annual report: Vancouver, British Columbia, Canada, Placer Dome Gold Inc., 92 p.
Resolute Mining Ltd., 2004, 2004 annual report: Perth, Australia, Resolute Mining Ltd., 77 p.
Resource Information Unit, 2001, Tanzania, *in* Register of African mining 2001/02: Subiaco, Australia, Resource Information Unit, p. 279-301.
Resource Information Unit, 2003, Tanzania, *in* Register of African mining 2003/04: Subiaco, Australia, Resource Information Unit, p. 203-216.
Shanta Gold Ltd., 2005, Admission to AIM: Dar es Salaam, Tanzania, Shanta Gold Ltd., 101 p.

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The Mineral Industry of Tunisia

By Philip M. Mobbs

The Government owned all minerals in Tunisia. In 2004, mineral production included barite, clay, gypsum, iron ore, lead, phosphate rock, silver, and zinc. Salt was recovered primarily from coastal salt works. Mineral exploration and production were licensed by the Government according to the new Mining Code (law No. 2003-30 of April 28, 2003). The Hydrocarbon Code (law No. 99-93 of August 17, 1999) regulated offshore and onshore natural gas and oil exploration and production. Processed mineral commodities produced in Tunisia included ammonium fluoride, cement, fertilizers, lime, refined petroleum products, and steel. The country also had an extensive metal manufacturing sector, which included production of electrical wiring arrays for export to European automobile assembly plants.

The natural gas and petroleum sector accounted for about 3% of Tunisia's gross domestic product (GDP) in 2004. The cement, construction materials, glass, and mining sectors accounted for about 2.5% of the GDP and phosphate-based fertilizer production accounted for nearly 2%. In 2004, the GDP based on purchasing power parity of this 163,610-square-kilometer North African nation was estimated to be about $77.4 billion.[1] The per capita GDP based on purchasing power parity was $7,732 (International Monetary Fund, 2005§[2]).

Commodity Review

Metals

Gold.—In northwestern Tunisia, Albidon Ltd. of Australia initiated a regional geochemical sampling program on its Nefza exploration permit, which included the Kef El Agueb, the Oued Belif, and the Ras Rajel gold prospects.

Lead and Zinc.—In 2004, Breakwater Tunisia S.A. (a subsidiary of Breakwater Resources Ltd. of Canada) milled 330,392 metric tons (t) of lead-zinc ore. The Bougrine mill produced 52,149 t of zinc concentrates that contained 28,265 t of zinc and 8,499 t of lead concentrates that contained 5,470 t of lead. Ore was sourced primarily from Breakwater's Bougrine Mine and supplemented by feed (28,869 t) from the Government's lead-zinc mine. Breakwater projected that the Bougrine ore reserves would be depleted and that the mine would be closed by September 2005 (Breakwater Resources Ltd., 2005, p. 22-23).

The joint venture of Albidon and BHP World Exploration Inc. (a subsidiary of the BHP Billiton group) continued evaluation of the Jebel Trozza exploration permit. Albidon completed geologic mapping and rock chip sampling on the permit, which included the Jebel Touila zinc sulfide and the Jebel Trozza zinc oxide prospects.

In August, Maghreb Minerals Plc of the United Kingdom acquired 100% equity interest in High Marsh Holdings Ltd. of the British Virgin Islands, primarily from Consolidated Global Minerals Ltd. of Canada and Trident Nominees Ltd. In the transaction, Maghreb acquired interest in nine exploration permits, which included the Djebba, the Fej Lahdoum-Ain Jemmala, the Hammala, the Koudiat Sidii, the Lorbeus (Koudiat Louatia), and the Ouled Moussa prospects and options to acquire from the Government the inactive Bou Jabeur barite-lead-zinc mine and the operating Fej Lahdoum lead-zinc mine (Consolidated Global Minerals Ltd., 2004a, b; Maghreb Minerals Plc, 2004, p. 3, 57-58).

Industrial Minerals

Cement.—In 2003, Société des Ciments d'Enfidha started production from its second clinker line. The 1,900-metric-ton-per-day-capacity line was built by Polysius S.A.S. (World Cement, 2004).

The 400,000-metric-ton-per-year (t/yr)-capacity Terminal Cimentier de Gabès was opened in February 2004. The import terminal, which was owned by Société des Ciments d'Enfidha, Société des Ciments de Gabès, and Société des Ciments de Jbel Oust, was designed to handle petroleum coke. For environmental reasons, the cement companies were converting their cement facilities to burn coal or petroleum coke instead of residual fuel oil. In March, Société des Ciments de Jbel Oust commissioned a grinding mill that could process 35 metric tons per hour (t/hr) of coal, or 22 t/hr petroleum coke (World Cement, 2004; Corporación Uniland, S.A., undated§).

The Governments of Algeria and Tunisia offered to divest their interest in the jointly owned Société Tuniso-Algérienne de Ciment Blanc S.A., but the three bids received in 2004 by the Governments on the 200,000-t/yr-capacity cement plant at Feriana were not satisfactory. The plant's proposed privatization was rescheduled for early 2005 (Middle East Economic Digest, 2004; Société Tuniso-Algérienne de Ciment Blanc, 2005§).

Outlook

The country's export-oriented economic policy was strengthened in 2004 with the signing of the Agadir Agreement, which was a free trade agreement between Egypt, Jordan, Morocco, and Tunisia. All four nations also had Euro-Mediterranean Association Agreements, which included economic and social cooperation and bilateral free trade agreements with the European Union. The Agadir Agreement was considered to be the foundation for the creation of a Euro-Mediterranean free trade zone.

[1]Where necessary, values have been converted from Tunisian dinars (TD) to U.S. dollars (US$) at an average rate of TD1.29=US$1.00 for 2004 and TD1.31=US$1.00 for 2003.

[2]References that include a section mark (§) are found in the Internet References Cited section.

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The mineral and energy sectors, which accounted for about 17% of exports, are integral parts of Tunisia's economic future. Metal deposits in northern Tunisia are expected to continue to attract junior exploration companies. Light manufacturers, such as automobile electrical harness producers, are expected to increase the national consumption of copper as long as the demand for parts for vehicles manufactured in Europe continues. The hydrocarbon resources of Tunisia, which were small relative to the other oil-producing nations of North Africa, are expected to continue to attract independent oil companies.

References Cited

Breakwater Resources Ltd., 2005, 2004 Annual report: Toronto, Ontario, Canada, Breakwater Resources Ltd., March 31, 64 p.

Consolidated Global Minerals Ltd., 2004a, Maghreb acquires Global's Tunisian assets and is financed for $1.5 Million CDN: Vancouver, British Columbia, Canada, Consolidated Global Minerals Ltd. press release, 1 p.

Consolidated Global Minerals Ltd., 2004b, Option agreement extended on two operating mines—Tunisia North Africa: Vancouver, British Columbia, Canada, Consolidated Global Minerals Ltd. press release, 1 p.

Maghreb Minerals Plc, 2004, Alternative Investment Market admission document: London, United Kingdom, Maghreb Minerals Plc, 109 p.

Middle East Economic Digest, 2004, Sotacib offers evaluated: Middle East Economic Digest, v. 48, no. 26, June 25, p. 18.

World Cement, 2004, North African review—Tunisia: World Cement, v. 35, no. 6, June, p. 62.

Internet References Cited

Corporación Uniland, S.A., [undated], Terminal Cimentier de Gabès, accessed August 8, 2005, at URL http://www.uniland.es/unilandwebfront/fr/asp/mun_tun_cem_fab_gab.asp.

International Monetary Fund, 2005 (April), Tunisia, World Economic Outlook Database, accessed May 3, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

Société Tuniso-Algérienne de Ciment Blanc, 2005, International invitation to tender for the privatization of Sotacib, accessed August 8, 2005, via URL http://www.polymarketing.de/sotacib/ang/appels.php.

Major Sources of Information

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TABLE 1
TUNISIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004[p]
METALS						
Iron and steel:						
Iron ore:						
Direct shipping ore and concentrate, gross weight		182	204	198	164	244
Fe content		98	109 [e]	105	97	128
Metal:						
Pig iron		196	192	152	36	--
Steel, crude		237	239	200	86	70
Lead, mine output, Pb content	metric tons	6,602	6,820 [e]	5,081	5,000	5,500 [e]
Silver metal, primary[e]	kilograms	3,700	3,650	3,000	3,000	3,000
Zinc:						
Concentrate, gross weight	metric tons	74,996	73,000	64,890	65,800	52,747
Zn content	do.	41,247	37,900 [e]	35,692	36,000	29,011
INDUSTRIAL MINERALS						
Barite	do.	3,702	2,208	5,539	3,000	1,813
Cement, hydraulic[3]		5,657	5,721	6,022	6,038	7,124
Clays, for construction and clay products		3,870	4,260	4,400	4,500	5,000 [e]
Fertilizers:						
Triple superphosphate		805	783	796	875	872
Phosphoric acid		1,043	1,144	1,219	1,164	1,241
Diammonium phosphate		1,113	1,124	1,315	1,324	1,313
Ammonium nitrate		182	170	127	164	130
Fluorine, aluminum fluoride		43	44	39	45	45 [e]
Gypsum[e, 4]		125	125	125	110	130
Lime		517	467	471	446	450 [e]
Phosphate rock, washed, gross weight		8,339	8,144	7,461	7,890	7,954
Salt, marine		620	654	616	700	608
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	1,985	2,254	2,149	2,167	2,530
Dry[e]	do.	1,600	1,800	1,700	1,750	2,050
Petroleum:						
Crude	thousand 42-gallon barrels	28,207	26,300	26,800	24,300	25,700
Refinery products:						
Liquefied petroleum gas	do.	1,279	1,180	1,310	1,200	1,300
Gasoline	do.	3,301	3,690	3,380	3,600	3,700
Kerosene	do.	1,216	1,560	1,590	1,270	1,300
Distillate fuel oil	do.	4,010	3,490	3,500	3,780	4,000
Residual fuel oil	do.	4,346	3,950	4,020	4,050	3,200
Other[e]	do.	940	940	1,120	1,180	400
Total[e]	do.	15,100	14,800	14,900	15,100	13,900

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. -- Zero.

[1]Table includes data available through August 10, 2005.

[2]In addition to the commodities listed, a variety of crude construction materials (sand and gravel and stone) was produced, but output was not reported, and available information was inadequate to make estimates of output levels.

[3]Includes white cement production, in thousand metric tons: 2000--250; 2001--247; 2002--259; 2003--292; and 2004--304.

[4]Does not include phosphatic gypsum (waste product) generated during fertilizer production.

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TABLE 2
TUNISIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Aluminum fluoride		Industries Chimiques du Fluor	Ghannouch, near Gabès	42
Cement:				
Portland		Société des Ciment d'Enfidha	Enfidha	2,000
Do.		Société des Ciment de Jbel Oust	Jbel Oust	1,200
Do.		Société des Ciment d'Oum el Kélil	Le Kef	970
Do.		Société des Ciment de Bizerte	Bizerte	840
Do.		Société des Ciments Artificiels Tunisiens	Ben Arous	800
Do.		Société des Ciment de Gabès	Gabès	733
White		Société Tuniso-Algérienne de Ciment Blanc S.A.	Feriana	200
Fertilizer:				
Ammonium nitrate		Group Chimique Tunisienne	Ghannouch, near Gabès	330
Diammonium phosphate		do.	do.	1,000
Triple superphosphate		do.	M'Dhilla	465
Do.		do.	Sfax	330
Iron and steel:				
Iron ore		Société de Djebel Djerissa	Djerissa Mine	175
Do.		do.	Tamera Mine	75
Steel, crude		Société Tunisienne de Sidérurgie	El Fouladh	70
Steel, rolled, bar and rod		Intermetal S.A.	Ben Arous	300
Lead and zinc ore		Breakwater Tunisia S.A.	Bougrine Mine	330
Do.		Compagnie Miniere du Nord Ouest	Fej Lahdoum	50
Petroleum, refined	42-gallon barrels per day	Société Tunisienne des Industries du Raffinage	Bizerte	34,000
Phosphate rock		Compagnie des Phosphates de Gafsa	Kef Eddour Mine	3,200
Do.		do.	Kef Eschfair Mine	3,000
Do.		do.	Jallabia	1,700
Do.		do.	Redeyef Mine	150
Phosphoric acid		Group Chimique Tunisienne	Ghannouch, near Gabès	405
Do.		do.	Skhira	365
Do.		do.	M'Dhilla	183
Do.		do.	Sfax	131
Salt		Compagnie Générale des Salines de Tunisie	Zarzis and Sahline Sousse	750
Do.		SAIDA S.A.	Sebkhet Sidi El Héni, Zéramdine	250

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THE MINERAL INDUSTRY OF UGANDA

By Thomas R. Yager

The East African country of Uganda was known to produce cobalt, columbium (niobium) and tantalum, gold, iron ore, steel, tin, and tungsten. Uganda also produced such industrial minerals as gypsum, kaolin and other clays, lime, salt, talc, and vermiculite, and such building materials as cement, limestone, and pozzolanic materials.

Uganda's gross domestic product (GDP) increased by 5.9% in 2004 after rising by 4.7% in 2003. The GDP was $44.7 billion based on purchasing power parity, and the per capita GDP based on purchasing power parity was about $1,700. In 2003, construction accounted for 10% of the GDP; manufacturing, 9%; water and electricity, 1%; and mining and quarrying, 1% (Uganda Bureau of Statistics, 2004, p. 184; International Monetary Fund, 2005, p. 206; 2005§1).

In July 2004, the Parliament of Uganda authorized the Government to borrow $42.3 million from the African Development Fund, the Nordic Development Fund, and the World Bank Group to finance the Sustainable Management of Mineral Resources Project, which would assist Uganda in increasing production and tax revenues from its mining sector (Mutumba, 2004).

Commodity Review

Metals

Cobalt and Copper.—Kasese Cobalt Company Ltd. (Blue Earth Refineries Ltd., 75%) produced refined cobalt from the Kilembe stockpile. In May 2004, operations restarted because of higher cobalt prices; production amounted to 436 metric tons (t) by yearend. Blue Earth was spun off by parent company MFC Bancorp Ltd. in late December. In 2004, cobalt exports amounted to $10 million, or 1% of total exports (Bank of Uganda, 2004, 2005; MFC Bancorp Ltd., 2005).

In September 2004, Uganda Gold Mining Ltd. (UGM) of Canada signed an agreement with the state-owned Kilembe Mines Ltd. in which UGM could earn a 70% interest in the Kilembe copper-cobalt mine by conducting exploration and a feasibility study. The Kilembe Mine has not produced since 1977. In 2004, Signature Resources Ltd. obtained exclusive prospecting licenses adjacent to the Kilembe Mine and near Kafunzo (Uganda Gold Mining Ltd., 2004).

Columbium (Niobium) and Tantalum.—M/S Technical Support and Services Ltd. produced 30 kilograms per day of tantalite from tailings at the Wampewo Mine in 2003. In 2004, national production of columbite-tantalite concentrate fell to 4,200 kilograms (kg) from 16,240 kg in 2003 (Uganda Ministry of Energy and Mineral Development, 2004, p. 31).

Gold.—M/S Busitema Mining Company Ltd. produced 37 kg of gold in 2003. Production was inhibited by an unstable electricity supply. In 2004, Canmin Gold Ltd. [a subsidiary of International Business Investments Corp. (IBI)] explored for gold in Busia, which is located in southeastern Uganda. Glencar Mining plc of Ireland explored for gold at Buinja. In 2004, gold exports were $73.8 million, or 10% of total exports. The majority of gold exports was reported to be re-exports from Congo (Kinshasa) (Bank of Uganda, 2004, 2005; Uganda Ministry of Energy and Mineral Development, 2004, p. 33; International Business Investments Corp., 2005).

Iron and Steel.—The Madhvani Group of Uganda planned to restart production of rebar at its rolling mill Steel Corp. of East Africa Ltd. Madvanhi was considering reopening plants in Nairobi to provide the mill with a steady supply of billet (Metal Bulletin, 2004).

Industrial Minerals

Cement.—Uganda's cement production rose to 507,068 t in 2003 from 505,959 t in 2002 and 321,329 t in 1998. By 2005, Hima Cement Industries Ltd. and Tororo Cement Industries Ltd. planned to complete expansions at a cost of $30 million and $45 million, respectively. Hima's clinker plant and Tororo's cement plant would each have a capacity of 365,000 metric tons per year (t/yr) (World Bank Group, 2003, p. 58-59; Uganda Bureau of Statistics, 2004, p. 163).

Clays.—S.L.P. Engineering Co. Ltd. mined small amounts of kaolin at Migadde until 2003, when production shut down because of poor market conditions. Muhindo Enterprises Ltd. planned to start kaolin production in 2005. The company planned to produce 150,000 t/yr of kaolin at a value of $7.5 million; 50,000 t/yr of metakaolin at a value of $5 million; and 30,000 t/yr of aluminum sulfate at a value of $9 million. By late 2004, Muhindo had invested $4 million in the project; the company planned to triple or quadruple its production in 10 to 15 years. Kaolin was expected to be consumed domestically in floor and wall tiles (Ssonko, 2004; Uganda Ministry of Energy and Mineral Development, 2004, p. 31).

Stone, Crushed.—The production of limestone rose to 272,325 t in 2004 from 226,408 t in 2003. In 2004, Zzimwe Construction Ltd. commissioned Uganda's largest quarry in Mukono District at a cost of $2 million. The crushing plant was expected to produce 1,400 tons per day of stone, or 19% of national crushed stone production, for asphalt, housing, road base, and other applications. The project was expected to have a life of 55 years (Lumu, 2004).

Vermiculite.—Canmin Resources Ltd. (a subsidiary of IBI) produced vermiculite at the Namekera Mine. In 2004, the company's production increased to 2,688 t from 1,724 t in 2003. About 3% of the company's sales were to Ugandan consumers in 2004 (International Business Investments Corp., 2005).

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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Mineral Fuels

Petroleum.—Uganda did not have production facilities for crude petroleum or petroleum products. In 2004, imports of refined petroleum products amounted to $145.3 million, or nearly 10% of total imports. Heritage Oil Corp. abandoned a well in Block 3 on Lake Albert. In July, Heritage and Energy Africa Ltd. signed an agreement for Block 1, which covered the Pakwach Basin (Africa Energy Intelligence, 2004; Bank of Uganda, 2004, 2005).

Infrastructure

Uganda's electricity production increased to 1,757 gigawatthours (GWh) in 2003 from 1,702 GWh in 2002 and 1,342 GWh in 1999. Most domestic production came from hydroelectric power sources. In 2003, Uganda had a generating capacity of 303 megawatts (MW); peak demand was 279 MW of capacity. Exports of electricity amounted to $12.1 million, or 2% of total exports (Bank of Uganda, 2004, 2005; Uganda Bureau of Statistics, 2004, p. 164).

Outlook

The International Monetary Fund (2005, p. 208) predicted that Uganda's GDP would grow by 5.2% in 2005 and 6.4% in 2006. Depending upon world market conditions and current and future investments in the minerals sector, the value of mineral production could rise to between $128 million and $203 million in 2008 from $41 million in 2000 (World Bank Group, 2003, p. 58-59).

References Cited

Africa Energy Intelligence, 2004, Uganda—Heritage keeps trying: Africa Energy Intelligence, no. 373, July 7-20, 5 p.

Bank of Uganda, 2004, Monthly economic and financial indicators: Kampala, Uganda, Bank of Uganda, July, 9 p.

Bank of Uganda, 2005, Monthly economic and financial indicators: Kampala, Uganda, Bank of Uganda, January, 10 p.

International Business Investments Corp., 2005, IBI financial report to shareholders for December 31, 2004: Port Perry, Ontario, Canada, International Business Investments Corp. press release, May 20, 15 p.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Lumu, David, 2004, Zzimwe opens biggest quarry: Weekly Observer, [Kampala, Uganda], August 12, 1 p.

Metal Bulletin, 2004, [Untitled]: Metal Bulletin, no. 8837, April 12, p. 20.

MFC Bancorp Ltd., 2005, Blue Earth Refineries Inc. announces update on operations: Vienna, Austria, MFC Bancorp Ltd. press release, April 14, 2 p.

Mutumba, Richard, 2004, MP's okay Sh80b loan for mineral project: Monitor [Kampala, Uganda], July 23, 1 p.

Ssonko, Kiganda, 2004, Kaolin to fetch $21.5m in 2005: New Vision [Kampala, Uganda], August 24, 2 p.

Uganda Bureau of Statistics, 2004, 2004 statistical abstract: Entebbe, Uganda, Uganda Bureau of Statistics, 240 p.

Uganda Gold Mining Ltd., 2004, Uganda Gold poised to earn majority interest in copper-cobalt mine in Uganda: Vancouver, British Columbia, Canada, Uganda Gold Mining Ltd. press release, September 30, 2 p.

Uganda Ministry of Energy and Mineral Development, 2004, Annual report 2003: Kampala, Uganda, Uganda Ministry of Energy and Mineral Development, 90 p.

World Bank Group, 2003, Sustainable management of mineral resources project—Project appraisal document: Washington, DC, World Bank Group, Report No. 26886-UG, November 11, 90 p.

Internet Reference Cited

International Monetary Fund, 2005 (April), Uganda, World Economic Outlook Database, accessed June 29, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/ index.htm.

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TABLE 1
UGANDA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
Cement, hydraulic		367,470	431,084 r	505,959	507,068 r	520,000 e
Clay:						
Kaolin		14	90	178	-- r	--
Other		NA	73,505	44,790	44,000 r, e	44,000 e
Cobalt, refined		420	634	450 e	--	436
Columbium (niobium) and tantalum:						
Gross weight, ore and concentrate	kilograms	2,712	11,092	6,463	16,240 r	4,200
Nb content	do.	992	5,211	3,036	7,600 r	2,000 e
Ta content	do.	689	2,979	1,736	4,400 r	1,100 e
Gold, mine output, Au content[3]	do.	56	(4)	3	40 r	178
Gypsum		--	--	5	43 r	164
Iron ore		4,632	1,236	--	--	--
Lime, hydrated and quick[e]		10,000	10,000	10,000	10,000	10,000
Limestone		253,032	229,792	140,022	226,408	272,325
Pozzolanic materials		35,603	22,782	12,388	65,587 r	66,000 e
Salt[e]		5,000	5,000	5,000	5,000	5,000
Steel[e]		7,000	7,000	7,000	7,000	7,000
Tin, mine output, Sn content		(4)	18	--	1 r	3
Tungsten, mine output, W content		(4)	17	16	1 r	12
Vermiculite		--	200 r	664	1,724	2,688

[e] Estimated. [r] Revised. NA Not available. -- Zero.

[1] Includes data available through June 29, 2005.

[2] In addition to the commodities listed, corundum, lead, marble, sand and gravel, silica sand, and soapstone are presumably produced, but information is inadequate to estimate output.

[3] Does not include smuggled artisanal production.

[4] Less than 1/2 unit.

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TABLE 2
UGANDA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Hima Cement Industries Ltd. (Bamburi Cement Ltd., 70%)	Kasese	300,000
Do.	Tororo Cement Industries Ltd.	Tororo	220,000
Cobalt, refined	Kasese Cobalt Company Ltd. (Blue Earth Refineries Ltd., 75%; Government, 25%)	Kasese	1,000
Columbium (niobium) and tantalum	M/S Technical Support and Services Ltd.	Wampewo	11,000 e
Gold kilograms	M/S Busitema Mining Company Ltd.	Busitema	NA
Lead, refined secondary	Uganda Batteries Ltd.	Kampala	1,000
Soapstone	African Minerals Ltd.	Moroto	NA
Steel:[1]			
Crude[2]	Steel Corp. of East Africa Ltd. (subsidiary of Madhvani Group)	Jinja	25,000
Do.	Steel Rolling Mills Ltd. (subsidiary of Alam Group Ltd.)	do.	21,000
Billet[2]	Steel Corp. of East Africa Ltd. (subsidiary of Madhvani Group)	do.	60,000
Rolled[2]	do.	do.	101,200
Do.	Steel Rolling Mills Ltd.	do.	24,000
Do.	BM Technical Services Ltd.	Mbarara	20,000
Do.	Sembule Steel Mills Ltd.	Kampala	20,000
Stone, crushed	Hima Cement Industries Ltd.	Cave Hill,[3] Lime Kiln Hill, and Tank Hill[3]	NA
Do.	Kilembe Mines Ltd.	Hima	NA
Do.	Hima Cement Industries	Dura,[3] Hima, and Suka[3]	NA
Do.	Zzimwe Construction Ltd.	Mukono District	690,000
Tungsten	Krone Uganda Ltd.	Nyamurilo	115
Vermiculite	Canmin Resources Ltd. (subsidiary of International Business Investments Corp.)	Namekara	25,000

[e]Estimated. NA Not available.
[5]In addition to its crude, billet, and rolled steel facilities, Uganda has a galvanized steel plant with a capacity of 30,000 metric tons per year.
[2]Not operating in 2004.
[3]Not operating in 2003; more-recent information is not available.

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The Mineral Industry of Zambia

By Philip M. Mobbs

Zambia is a landlocked southern African country with an area of 752,614 square kilometers. In 2004, Zambia had an estimated population of 10.5 million. The mining sector was dominated by copper and cobalt production and the country was a leading producer of cobalt, copper, and gem-quality emerald. Coal, a variety of mineral commodities for the construction industry, other gemstones (primarily amethyst, beryl, and tourmaline), sulfur, and refined petroleum products also were produced in Zambia (World Bank Group, 2005§[1]).

In 2004, Zambia's real gross domestic product (GDP) grew by 5.0% and inflation declined to 18% from 21.5% in 2003. The GDP based on purchasing power parity was estimated to be $9.85 billion, and the GDP per capita based on purchasing power parity was estimated to be $870 (International Monetary Fund, 2005§).

Government Policies and Programs

Mining operations were regulated by the Mines and Minerals Act (No. 31) of September 13, 1995. The Government encouraged private development and diversification of the mining sector and promoted small-scale mining, especially of gemstones. The Environmental Protection and Pollution Control Act (No. 12) of 1990 and the Mines and Minerals (Environmental) Regulations of 1997 also regulated mining operations.

Most of the mining assets of the Government-controlled Zambia Consolidated Copper Mines Ltd. (ZCCM) had been divested by 2000; when a few privatization efforts failed, however, the operations were reoffered for new privatization bids. ZCCM subsequently was reorganized as ZCCM Investment Holdings Plc (ZCCM-IH), which retained a minority interest in the privatized mines. In 2004, the Government continued efforts to privatize coal, limestone, gemstones, and other small-scale mining operations and to attract foreign investors to develop known industrial and metallic mineral resources.

Exports of scrap metal were banned in September 2004. The Government initiated the ban to encourage the local iron foundry industry and to reduce the vandalization of copper wire from the electricity and telephone companies (Zambia Daily Mail, undated§).

Commodity Review

Metals

Cobalt and Copper.—The country's leading copper company, Konkola Copper Mines Plc (KCM), was again privatized in November 2004 when Vedanta Resources plc, which was an Indian-managed company registered in the United Kingdom, acquired 51% interest in KCM. Zambia Copper Investments Ltd. (ZCI) retained 28.4% interest in KCM, the state-owned ZCCM-IH retained 20.6% interest, and the Government held a "Golden Share," which allowed it to intervene when the company's actions were perceived not to be in the interest of Zambia. As part of the purchase, Vedanta obtained an option to purchase ZCI's interest in KCM. KCM operated underground copper mines at Konkola and Nchanga, an open pit copper mine at Nchanga, an underground pyrite mine at Nampundwe, a solvent extraction-electrowinning (SX-EW) plant at Nchanga, and a copper smelter and refinery at Nkana (Vedanta Resources plc, 2005, p. 5; Zambia Copper Investments Ltd., 2005, p. 4, 7; Zambia Privatisation Agency, undated§).

First Quantum Minerals Ltd. of Canada operated the Bwana Mkubwa SX-EW plant near Ndola to process ore from its Lonshi Mine, which is located 36 kilometers (km) across the border in the Democratic Republic of the Congo [Congo (Kinshasa)]. During 2004, First Quantum transported about 669,000 metric tons (t) of ore that contained an average of 5.5% copper from Lonshi to the Bwana Mkubwa plant. The plant produced 41,546 t of refined cathode copper in 2004 compared with 29,513 t in 2003. This increased production accounted for about 57% of the total increase in the country's electrowon copper output in 2004. The Bwana Mkubwa operation also produced 140,200 t of sulfuric acid; the surplus (66,460 t) was sold to other Copperbelt operators. First Quantum also continued development of the Kansanshi copper mine near Solwezi; production was expected to begin in 2005 (First Quantum Minerals Ltd., 2005, p. 19-21).

In 2004, Luanshya Copper Mines Plc (LCM) [a subsidiary of the J&W Investment Group of Switzerland (85% interest) and ZCCM-IH (15%)] produced about 20,000 t of copper in concentrate at the Baluba Mine; the concentrate was processed by the cobalt-processing company Chambishi Metals plc, which was also a subsidiary of the J&W Investment Group (90% interest) and ZCCM-IH (10%). In 2003, LCM had acquired the Baluba and the Luanshya Mines and the undeveloped Muliashi North deposit. LCM did not expect to reopen the Luanshya Mine, which was operated from the 1930s until it was closed in 2001 after being flooded. In 2004, Chambishi Metals, which also processed material from the Nkana slag dumps, recovered 4,500 t of cobalt in addition to copper (Tassell, 2004a; Times of Zambia, 2005§).

In 2005, Metorex Ltd. of South Africa expected to close the Chibulma West Mine where the economic reserves were nearly exhausted. Metorex also continued work on the decline at the Chibulma South Mine. Ground conditions pushed the planned opening of the underground Chibulma South Mine into 2005 (Metorex Ltd., 2005, p. 17).

Mopani Copper Mines plc, which was the second-ranked copper-cobalt producer in Zambia, was owned by Glencore

[1]References that include a section mark (§) are found in the Internet References Cited section.

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International AG (73.1% interest), First Quantum Minerals Ltd. (16.9%), and ZCCM-IH (10%). In 2004, Mopani produced about 160,000 t of copper and about 2,000 t of cobalt from the Mufulira Mine, smelter, and copper refinery and the Nkana Mine and cobalt refinery (First Quantum Minerals Ltd., 2005, p. 25).

Mopani had several projects underway to rehabilitate and expand production capabilities. At the Mufulira Mine, Mopani continued the project to deepen the mine to 1,640 meters (m) from 1,340 m and proposed to use 55-t dump trucks in the mine. Mopani also started an in situ leach of the pillars and the stopes that had been back-filled with tailings in the upper levels of the mine and began construction of an 18,000-metric-ton-per-year (t/yr)-capacity SX-EW plant. Work continued on the proposed replacement of the Mufulira smelter's 30-year-old 450,000-t/yr-capacity electric arc furnace with an ISASMELT furnace, which was designed to process 650,000 t/yr of concentrate. At Nkana, work included the expansion of one of the four shafts at the mine, which was to handle the development of two additional levels in the Synclinorium area, and a new heap-leach and solvent-extraction operation of the Mindola North open pit copper mine (Tassell, 2004b; Musunka, 2005§).

NFC Africa Mining Plc. [a subsidiary of China Nonferrous Metal Industry Foreign Engineering and Construction Co., Ltd. (85% interest) and ZCCM-IH (15%)] ramped up production from the Chambishi underground mine and mill. The Chambishi operation produced 49,054 t of copper concentrates in 2004 (Minerals Engineering International, 2005§).

In 2004, the Government awarded the Lumwana Joint Venture of Equinox Resources Ltd. of Australia (51% equity interest) and Phelps Dodge Corp. of the United States (49%) a 25-year Large Scale Mining License for cobalt, copper, gold, and silver. The joint venture continued exploration of the Lumwana Copper Project, which is located 220 km northwest of the main Zambian Copperbelt in northwestern Zambia. Equinox, which continued negotiations to acquire a full 100% ownership in the project, proposed to start the development of the Lumwana prospect in 2005 and to begin production during the second half of 2006 (Equinox Resources Ltd., 2005).

Other exploration in Zambia included the recovery and testing of a mini-bulk sample by Caledonia Mining Corp. of Canada on its Nama cobalt-copper project. Caledonia proposed to build a pilot plant in 2005 to produce a cobalt concentrate for smelter testing. African Eagle Resources plc of the United Kingdom drilled the Eagle Eye and the Mwezi iron oxide copper gold prospects of its Sasare License, which is located near the Mozambique border in eastern Zambia. Billiton Development Ltd. of Zambia (a subsidiary of BHP Billiton Ltd.) completed a geophysical survey on the Mumbwa copper-gold prospect for its joint venture with AIM Resources Ltd. of Australia. Zambezi Resources Ltd., which was an Australian-managed company registered in Bermuda, continued prospecting and sampling of its copper, gold, and nickel projects in Zambia.

Gold.—Luiri Gold Exploration Co. explored its gold licenses that included the former Dunrobin Mine, which closed in 2000, and the Matala Mine, which closed in 1941.

Nickel.—Albidon Ltd. of Australia completed an airborne geophysical survey of the adjacent Kabeswa and Munali licenses and continued drilling its Munali nickel prospect. In October, Albidon entered into a joint venture with WMC Resources Exploration Pty. Ltd. of Australia (a subsidiary of WMC Resources Ltd.), which subsequently funded a soil sampling program on the Zimba nickel prospect.

Industrial Minerals

Diamond and Gemstones.—Redevelopment of Zambia's gemstone industry by the private sector was a goal of the Mining Sector Diversification Programme, which was a 5-year Ministry of Mines and Mineral Development project that had begun in 2002 and was financially supported by the European Development Fund. Aquamarine and tourmaline were recovered in the Lundazi pegmatite area of eastern Zambia. Tourmaline was also mined at the Jagoda Mine of Jagoda Gems Ltd. and at the Kumanga Mine of Gemstone Marketing & Consultancy Ltd. in the Mkushi area in central Zambia.

In northwestern Zambia near the Angolan border, the joint venture of Motapa Diamonds Inc. (60%) (an affiliate of BHP-Billiton World Exploration Inc.) and Caledonia Mining (40%) completed a 5,000-line-kilometer airborne gravity and magnetic survey over the Mulonga Plain diamond license. The joint venture also completed sampling programs on the Kashiji Plain and the Lukulu diamond licenses.

Emerald mining was concentrated in the Ndola Rural Protected Area, which is located about 40 km west of Kitwe. In addition to the mechanized operations that included the Chantete Mine of Samico Mining Co. Ltd.; the Grizzly Mine of Grizzly Mining Zambia Ltd.; the Kagem licenses of Kagem Mining Ltd.; the Kamakanga Mine of Kuber Minerals & Metal Mining Co. Ltd.; the open pit and underground operations of Mitondo Mining Co. Ltd.; the Pirala and the Twampane Mines of Sorti Mining Ltd.; and the operations of Sarunit Enterprises Ltd, other emerald mining interests included numerous small-scale operations and under-funded inactive license holders. In June, the Government announced a $218,400[2] program for the support of gemstone mining (Kalero, 2004§).

Lime and Limestone.—In 2004, the Zambia Privatisation Agency and Athi River Mining Ltd. of Kenya began negotiations on the privatization of Ndola Lime Company Ltd., which was Zambia's sole producer of limestone and lime. Negotiations continued at yearend.

Infrastructure

As a landlocked country, Zambia was dependent on truck and rail transport to sustain most of its economy. The truck road and railway networks within the country and externally were reasonably adequate for access to ocean and lake ports for international trade. The principal rail routes from Ndola ran nearly 2,000 km northeast to the Port of Dar es Salaam, Tanzania, and south through Zimbabwe. From Zimbabwe, rail traffic could be diverted to the Port of Beira, Mozambique,

[2]Where necessary, values have been converted from Zambian kwacha (ZmK) to U.S. dollars (US$) at the average rate of ZmK4,758=US$1.00 for 2004.

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which is located roughly 2,000 km from Ndola, or to South African ports, which are located more than 2,500 km from Ndola. The more than 2,200-km rail line that ran north into Congo (Kinshasa) and west to the Port of Benguela (Lobito), Angola, remained closed. Major highways generally paralleled the rail lines.

The crude oil pipeline that ran about 1,700 km from Dar es Salaam to the Ideni refinery in Ndola was owned and operated by Tazama Pipelines Ltd., which was a joint venture of the Tanzanian and the Zambian Governments. The pipeline was capable of transporting about 22,000 barrels per day of crude petroleum.

Zambia had no domestic resources of oil and gas and was dependent primarily on hydroelectric power for most of the country's power needs, although there was some coal-fueled electricity power generation.

Outlook

Despite setbacks caused by the general decline in international cobalt and copper prices from 1995 to 2002, Zambia's program to privatize the cobalt and copper mining sector has been generally successful in attracting significant new investment to revitalize the formerly declining industry. The country faced several internal and external hurdles to development, which included cyclical world commodity prices; high transportation costs; limited national infrastructure, particularly west of the Copperbelt; and the threat that high HIV/AIDS rates in the region posed on maintaining a skilled labor force. On the positive side, the apparent end of the civil wars in neighboring Angola and Congo (Kinshasa) is expected to help reduce the political risk of financing new projects. Restructuring of the gemstone sector and efforts to manage the export flow of gemstones more effectively also have the potential to generate a larger value-added industry in Zambia.

References Cited

Equinox Resources Ltd., 2005, Equinox acquires 100% of Lumwana Copper Project—New copper deposit discovered close to proposed process plant: Toronto, Ontario, Canada, Equinox Resources Ltd. press release, January 12, 5 p.

First Quantum Minerals Ltd., 2005, 04 annual report: Vancouver, British Columbia, Canada, First Quantum Minerals Ltd., 72 p.

Metorex Ltd., 2005, Annual report 2005: Rosebank, South Africa, Metorex Ltd., 64 p.

Tassell, Arthur, 2004a, Baluba poised to restart operations: African Mining, v. 9, no. 3, May-June, p, 54-56.

Tassell, Arthur, 2004b, Mopani in major expansion phase: African Mining, v. 9, no. 3, May-June, p, 62-63.

Vedanta Resources plc, 2005, Vedanta Resources plc interim results for the six months ended 30 September 2005: London, United Kingdom, Vedanta Resources plc, November 17, 31 p.

Zambia Copper Investments Ltd., 2005, Annual report 2004: Hamilton, Bermuda, Zambia Copper Investments Ltd., 44 p.

Internet References Cited

International Monetary Fund, 2005 (September), Zambia, World Economic Outlook Database, accessed September 30, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.

Kalero, Rogers, 2004 (June 2), State releases K1bn for gemstone mining, accessed June 2, 2004, at URL http://www.times.co.zm/news/viewnews.cgi?category=6&id=1085800958.

Minerals Engineering International, 2005 (October 26), Zambian Chambishi to build $100 mln copper smelter, accessed November 29, 2005, at URL http://www.min-eng.com/ops/af/143.html.

Musunka, Martin, 2005 (June 21), Mopani creates winning team, accessed November 29, 2005, at URL http://www.times.co.zm/news/viewnews.cgi?category=all&id=1119343263.

Times of Zambia, 2005 (June), World cobalt price outlook brightens, accessed November 28, 2005, at URL http://www.zamnet.zm/newsys/news/viewnews.cgi?category=3&id=1117528124.

World Bank Group, 2005, World development indicators 2005, accessed November 28, 2005, via URL http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/ 0,,contentMDK:20523710~hlPK:1365919~menuPK:64133159~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html.

Zambia Daily Mail [undated], Scrap metal 'scroungers' make money—Clean up surroundings, accessed November 23, 2005, at URL http://www.zamnet.zm/newsys/viewnews.cgi?category=4&id=1131619884.

Zambia Privatisation Agency [undated], The Privatisation Programme in Zambia, accessed November 29, 2005, at URL http://www.zpa.org.zm/qzampart.htm.

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TABLE 1
ZAMBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[e]
METALS						
Cobalt:						
Mine output, Co content		4,600	8,000 [e]	10,000 [e]	11,300	13,000
Metal, Co content		3,342	4,657	6,144	6,550	7,800
Copper:[2]						
Mine output, Cu content:						
By concentration or cementation		184,100	233,000	258,000 [r]	269,000 [r]	344,300 [3]
Leaching, electrowon		65,000	79,000	83,000 [r]	79,000 [r]	82,600 [3]
Total		249,100	312,000	341,000 [r]	348,000 [r]	426,900 [3]
Metal:						
Smelter, primary:						
Electrowon, low grade		25,000	25,100	NA	NA	NA
Other		180,000	215,000	NA	NA	NA
Total		205,000	240,100	253,500	268,000	280,100 [3]
Refinery, primary:						
Electrowon		65,000	79,000	83,700	99,800	120,900 [3]
Other		162,400	217,000	253,100	250,000	277,300 [3]
Total		227,400	296,000	336,800	349,800	398,200 [3]
Gold	kilograms	600 [e]	--	--	--	--
Selenium, refined, gross weight	do.	9,370 [e]	--	--	--	--
Silver	do.	4,710 [e]	--	--	--	--
INDUSTRIAL MINERALS						
Cement		380,000	215,470	230,379	480,000	525,000
Clays:[e]						
Brick		3,000	3,000	3,000	3,000	3,300
Building, not further specified		30,000	30,000	30,000	30,000	33,000
China and ball		200	200	200	200	200
Gemstones:[e]						
Amethyst	kilograms	800,000	1,145,029 [3]	1,064,606 [3]	1,000,000	1,100,000
Beryl	do.	4,000	1,567 [3]	8,551 [3]	8,000	8,000
Emerald	do.	7,000	764 [3]	1,860 [3]	2,000	2,100
Garnet	do.	3,000	NA [3]	NA [3]	NA	NA
Tourmaline	do.	2,000	25,619 [3]	25,755 [3]	25,000	26,000
Gypsum[e]		11,000	--	--	--	--
Lime, calcined	thousand metric tons	142	117	151	145 [e]	150
Limestone, for cement and lime	do.	177	61	330	690 [r, e]	750
Limestone, crushed aggregate	do.	437	450	450	600 [e]	650
Sand and gravel, construction[e]	do.	200	200	200	200	220
Sulfur:						
Gross weight:						
Pyrite concentrate		50,000	199,400	225,870	226,000	280,000
Sulfuric acid[4]		110,000	63,000	10,000 [e]	10,000	12,000
Sulfur content:						
Pyrite concentrate (42% S)		21,000	83,752 [3]	94,900 [e]	95,000 [e]	118,000
Sulfuric acid (32.6% S)		35,800	20,500	3,260 [r, e]	3,300 [r, e]	3,900
Total, S content		56,800	102,252	98,200 [r, e]	98,300 [r, e]	122,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous		168,000	104,600 [3]	71,700	71,800	240,000
Petroleum, refinery products[e]	thousand 42-gallon barrels	--	--	--	5,000	6,200

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. NA Not available. -- Zero.
[1]Table includes data available through November 18, 2005.
[2]Terms used are as defined by the International Copper Study Group.
[3]Reported figure.
[4]From the Chambishi and the Nkana acid recovery plants.

Sources: Zambia Government data and company reports. Data estimated by the U.S. Geological Survey.

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THE MINERAL INDUSTRY OF ZIMBABWE

By Philip M. Mobbs

The Republic of Zimbabwe is a landlocked nation in southern Africa that is surrounded by Zambia to the north, Mozambique to the east, South Africa to the south, and Botswana to the west. It covers an area of 390,580 square kilometers. Based on purchasing power parity, the gross domestic product (GDP) in 2004 was estimated to be $27.09 billion,[1] and the GDP per capita was $2,309. For the sixth year in a row, the real GDP growth rate declined. The 4.2% decline in real GDP growth in 2004 followed a drop of 10.4% in 2003. Inflation had peaked at 623% in January 2004 before declining to low triple digits by yearend (Muñoz, 2005, p. 23; International Monetary Fund, 2005§[2]).

The mineral industry produced about 40 minerals or mineral-based commodities chiefly from small- and medium-scale mines. Despite the constraints of a deteriorating economy and uncertain political climate, several commodities, which included chromite, gold, graphite, lithium minerals, nickel, platinum-group metals (PGM), silver, tantalum, and vermiculite, posted production increases in 2004.

Mining and mineral-commodity companies continued production operations in 2004 despite Zimbabwe's hyperinflation. Additional uncertainty within the industry was caused by current or proposed Government policies. Varied ratios of official and unofficial foreign exchange rates used in the Government's foreign exchange policy differed by commodity and often adversely affected companies that exported production. Companies also were battered by increased domestic costs, such as fuel, electricity, and wages, and shortages of electricity, fuel, and spare parts, which often resulted in reduced equipment maintenance and development exploration. Local commercial interest rates dropped to an average of 202.5% in 2004 from 346% in 2003 (Coorey and others, 2005, p. 97).

Government Policies and Legislation

In April, a draft version of the Mines and Minerals Amendment Bill, 2004 was released. The legislation proposed that private mining companies transfer 50% of the total shares of Zimbabwe operations to "historically disadvantaged persons" within a 3-year period. Larger publicly held companies would be required to sell 25% of their interest in Zimbabwean operations within the same timeframe. In October, a new version of the legislation was released that proposed that 20% of the equity interest in Zimbabwe mines be transferred to "historically disadvantaged persons" within 2 years after Parliamentary approval, 25% within 7 years, and a total of 30% within 10 years (Mining Journal, 2004; Reuters, 2004§).

In December, the corporate tax rate was reduced to 15%. The new rate was backdated to January 1, 2004. The 3% royalty that had been imposed on gold production in January 2004 also was abolished (Aquarius Platinum Ltd., 2005, p. 10; Madiala, 2005§).

Trade

Most of the exports from and the imports to landlocked Zimbabwe were shipped through South Africa. In 2004, Zimbabwe again posted a negative balance of trade. The trade balance was estimated to be -$310 million in 2004, -$108 million in 2003, -$18 million in 2002, and $323 million in 2001. Exports [free on board (f.o.b)] were valued at $1.68 billion in 2004. The Government's poorly planned and often violent Fast Track Land Reform Program had badly damaged the commercial farming sector, which was the nation's traditional source of exports and foreign exchange. After the Government instituted a "Look East" policy in 2003, exports to the West dropped, but the percentage of total imports from the West remained at about the same level. About 30.2% of Zimbabwean exports was sent to South Africa in 2004 compared with 20.6% in 2003 and 16.8% in 2002. In 2004, Switzerland received 6% of Zimbabwean exports; the United Kingdom, 5.9%; China, 4.8%; and Germany, 4% (Coorey and others, 2005, p. 103-105).

In 2004, the value of manufacturing exports was estimated to be $620.9 million. Manufacturing exports included ferroalloys, which had an estimated value of $185.1 million in 2004(a 55% increase compared with 2003), and iron and steel, which had an estimatedvalue of $22.9 million. Mineral exports, which were estimated to be $604.2 million in 2004, exceeded agricultural exports, which were estimated to be $384.2 million, for the first time in years. The increased value of mineral exports was attributed to increased gold and PGM exports and world market prices for nickel. Historically a major export, gold exports rebounded to 20.9 metric tons (t) in 2004 from 13 t in 2003. In terms of value, gold exports in 2004 were $262.8 compared with $152.3 in 2003. In response to a 187% increase in the volume of platinum exports, the estimated value of platinum exports jumped to $174.4 million in 2004 from $77.4 million in 2003. The estimated value of nickel exports reached $95.7 million in 2004, which was up from a provisional $68.5 million in 2003 (Coorey and others, 2005, p. 103-105, 107).

In 2004, as in 2003, the majority of Zimbabwean imports were from South Africa. Total imports (f.o.b.) were valued at $1.99 billion, of which machinery and transportation equipment accounted for 21%; chemicals, 20.2%; and petroleum products, 17.2% (Coorey and others, 2005, p. 106-107).

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[1]Where necessary, values have been converted from Zimbabwe dollars (Z$) to U.S. dollars (US$) at the official rate of Z$824 =US$1.00 or at the average auction rate of Z$5,300 for 2004. In 2003, the official rate was Z$55=US$1.00 until March and $Z824=US$1.00 for the remainder of the year.

[2]References that include a section mark (§) are found in the Internet References Cited section.

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Commodity Review

Metals

Chromium.—Zimbabwe chromite production was used by the Gweru smelter of Zimbabwe Alloys Mines Ltd. (ZimAlloys), which was owned by Anglo American plc, and the Kwekwe smelter of Zimbabwe Mining and Smelting Co. (Pvt.) Ltd. (Zimasco) to produce high-carbon ferrochromium. In 2004, production of high-carbon ferrochromium declined by 21% to 193,077 t. Zimasco, which was the larger of the two plants, closed three of its six furnaces in April because of monetary losses under the Government's mandated foreign exchange conversion program. The furnaces were restarted about a month later after the Reserve Bank of Zimbabwe announced a revision to the monetary policy. In 2004, ZimAlloys produced about 31,000 t of high-carbon ferroalloys compared with 39,179 t in 2003. No low-carbon ferrochromium was produced during the year. The ZimAlloys plant had been reconfigured in 2001 to produce only high-carbon ferrochromium (Anglo American plc, 2005, p. 118; Magnowski, 2004).

Gold.—By law, all gold had to be sold to Fidelity Printers and Refiners (a subsidiary of the Reserve Bank of Zimbabwe). In January 2004, the Zimbabwe Mining Development Corp. reopened the Sabi Mine, which it had placed on care and maintenance in 2001 because of outstanding debts. In September, Mwana Africa Holdings acquired the Freda-Rebecca gold mine at Bindura from AngloGold Ashanti Ltd.

An estimated 300,000 to 1 million artisanal gold miners worked in Zimbabwe, especially along the Angwa, the Gwayi, the Manyame, the Mazowe, the Munyati, the Mupfure, the Mupfurudzi, the Odzi, the Ruenya, the Ruya, the Sanyati, the Thuli, and the Umzingwani Rivers. General environmental degradation of riparian areas was caused by deforestation for fuel wood for the informal miner settlements; the lack of waste disposal facilities; the miners' extensive pitting, tailings piles, and tunneling, which also resulted in the rapid silting of downstream agricultural reservoirs; and the release of liquid mercury and mercury vapor. Miners also suffered from the lack of adequate health services and clean drinking water (White, 2004; Boese-O'Reilly and others, 2004§; Shoko and Veiga, 2004§).

Iron and Steel.—The Government-controlled Zimbabwe Iron and Steel Company (ZISCO) steel plant had the capacity to produce 800,000 metric tons per year (t/yr) of crude steel, but the company's lack of working capital resulted in shortages of raw materials that reduced ZISCO's operating levels to about 20% of capacity (Kadzere, 2004§).

Nickel.—Bindura Nickel Corp. Ltd. (BNC) began another evaluation of the Hunter Road nickel deposit, which was located near Gweru. BNC (a subsidiary of Mwana Africa Holdings) operated the Shangani and the Trojan nickel mines and a nickel smelter and refinery at Bindura. Previous studies had estimated that the Hunter Road deposit contained 30 million metric tons (Mt) of ore at a grade of 0.6% nickel. Positive results from the evaluation, which was expected to be completed in 2005, and a proposed bankable feasibility study scheduled for 2006 could result in mine construction at Hunter Road beginning in 2008; initial nickel production could begin by 2010 (Zhuwakinyu, 2004§).

As a result of Rio Tinto plc's focus on the Murowa diamond operation, Rio Tinto's interest in the Empress nickel refinery, which processed matte supplied from Botswana on a toll basis, was spun off to Rio Tinto Zimbabwe Ltd. (Antwerp Facets News Service, 2004§).

Platinum-Group Metals.—Makwiro Platinum Mines (Pvt.) Ltd., which was owned by Zimbabwe Platinum Mines Ltd. (Zimplats) (70%) and Impala Platinum Mines Ltd. (Implats) (30%), operated the Ngezi open pit and underground platinum mines and the Selous metallurgical complex, which was located 77 kilometers (km) to the north of Ngezi. White PGM matte output from the Selous smelter was refined by Implats Refining Services facilities in South Africa. In 2004, Makwiro mined 1.773 Mt of ore from the open pit and 210,000 t from the trial underground mine. At the concentrator, 2.05 Mt of ore was milled, and the Selous smelter received 81,704 t of concentrate to process. In 2004, Makwiro sold 2,730 kilograms (kg) of platinum; 2,310 kg of palladium; 310 kg of gold; and 250 kg of rhodium, which was recovered from the smelter matte. Additionally, 1,602 t of nickel and 1,131 t of copper were sold. Late in the year, the mining contract for the open pit operation was renewed for 3 years, and the mining operation increased to 7 days per week from 6 (Zimbabwe Platinum Mines Ltd., 2005).

Mimosa Investments Ltd. (formerly Zimasco Consolidated Enterprise Platinum Ltd.) of Mauritius operated the Mimosa underground mine near Zvishavane at the southern end of the Great Dyke; Mimosa was a 50-50 partnership between Aquarius Platinum Ltd. of Australia and Implats. In 2004, the PGM concentrate produced by Mimosa that was sold to Implats Refining Services contained 1,884 kg of platinum, 1,387 kg of palladium, 260 kg of gold, and 152 kg of rhodium. Additionally, 1,717 t of nickel, 1,405 t of copper, and 53 t of cobalt were recovered from Mimosa concentrates produced in 2004 (Aquarius Platinum Ltd., 2005, p. 11-12).

Industrial Minerals

Cement.—The cement sector in Zimbabwe continued to be affected adversely by the country's hyperinflation. In 2004, cement prices increased by 80% under a cement price monitoring program that replaced Government price controls that had been in effect from 2001 to 2003 (Bhasera, 2004§).

Domestic cement demand declined because of the uncertainty generated by the country's economic situation and the increased cement prices that adversely affected the country's construction industry. Because of the reduced domestic demand for cement, Portland Holdings Ltd. (Porthold) (a subsidiary of Pretoria Portland Cement Co. Ltd. of South Africa) continued to export a significant volume of its cement production. In 2003, Porthold rehabilitated the Colleen Bawn plant while the plant was temporarily idled because of the lack of coal and diesel fuel. Coal shortages also resulted in the 6-week suspension of production in early 2004 by Circle Cement Ltd., in which the Lafarge Group held a 76% interest. Circle Cement's plant closed again in June and July while the company completed a major renovation of its facilities. In 2003, Sino-Zimbabwe

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Cement Co. Ltd. (a joint venture of China Building Material Industrial Corp. for Foreign Econo-Technical Cooperation of China and Industrial Development Corp. of Zimbabwe) had temporarily suspended operations in response to the shortages of foreign currency and fuel (International Cement Review, 2004).

Diamond.—Commercial diamond production from the Murowa Diamond (Pvt.) Ltd. operation began in late 2004. Production averaged about 20,000 carats per month from the mine, which was located near Zvishavane. Originally a joint venture between Rio Tinto Zimbabwe and Rio Tinto, the ownership structure on the Murowa operation was changed in July, when Rio Tinto increased its interest in Murowa Diamond to 78% after a swap of its 56% interest in Rio Tinto Zimbabwe for a proportionate share of Murowa Diamond. Rio Tinto Zimbabwe became an independent company, retained 22% interest in the Murowa Mine, and subsequently changed its name to RioZim Ltd. (Antwerp Facets News Service, 2004§; Njini, 2004a§).

Graphite.—Because of risks associated with the political situation in Zimbabwe, Graphit Kropfmühl AG wrote off its remaining investment of about $150,000 (€120,000) in the Zimbabwe German Graphite Mines (Pvt.) Ltd. after the March 2004 promulgation of International Accounting Standard 36—Impairment of Assets. Graphit Kropfmühl retained a 50% equity interest in Zimbabwe German Graphite Mines, which increased production by about 34% in 2004 (Graphit Kropfmühl AG, 2005, p. 14, 36).

Vermiculite.—Dinidza Vermiculite Mining (Pvt.) Ltd. resumed production in 2003 after a management change and plant rehabilitation. Plant output was expected to ramp up to 40,000 t/yr of salable product by 2005. Samrec Vermiculite (Pvt.) Ltd. (a subsidiary of the Imerys Group of France) operated the Shawa mine and plant at Dorowa. Both open pit mines excavated ore without drilling or blasting operations (Dinidza Vermiculite Mining (Pvt.) Ltd., 2004§).

Mineral Fuels

Zimbabwe had no domestic reserves of oil or gas and depended on coal, hydropower, and imports to meet its energy requirements. The rising international price of imported petroleum products resulted in a significant increase in the cost of imported fuels, which were valued at $342 million (at the official exchange rate) in 2004 compared with a provisional $110 million in 2003. Fuel and electrical power shortages remained major problems in Zimbabwe during the year. Zimbabwe Electricity Supply Authority (ZESA), which was the Government-owned electricity generating company, spent about $120 million in 2004 to import electrical energy from the Democratic Republic of the Congo, Mozambique, South Africa, and Zambia (Coorey and others, 2005, p. 106).

Coal.—In 2004, Wankie Colliery Co. Ltd., which operated the country's only coal mine near Hwange, changed its name to Hwange Colliery Co. Ltd. The Government remained the owner of a significant proportion of Hwange's equity. Coal production dropped again in 2004. Part of the decline was attributed to the closure in October of Hwange's 600,000-t/yr capacity M-Block underground mine after reserves were depleted. Production of coking and steam coal continued from the open pit mine. In 2004, development work continued on the underground 1.8-million-metric-ton-per-year-capacity 3 Main Mine. Hwange expected to begin production of coking coal from the 3 Main Mine in early 2005 and planned to double its coke production capacity to 400,000 t/yr (Wankie Colliery Co. Ltd. 2004; p. 23; Bain, 2004§; Herald, The, 2004§).

In 2004, Hwange proposed the development of an open pit mine on its Chaba concession, which was located about 6 km from the Hwange Power Station. Production from Chaba would cover the expected increased demand from the proposed expansion of the electricity-generating plant that ZESA originally proposed to complete by 2007. In 2004, however, ZESA lobbied for the transfer of the development rights to the Chaba concession to itself from Hwange. Expectations that Chinese and Indian investors would fund proposed expansions of ZESA's Hwange and Kariba South powerplants reportedly had failed because the international investors had requested coal mining rights that ZESA did not have to offer (Njini, 2004b§).

Also in early 2004, Beta Holding (Pvt.) Ltd. of Zimbabwe leased the Sengwa coal mine from Rio Tinto Zimbabwe. Subsidiary companies of Beta that could use coal for fuel included brick and tile producers. The open pit Sengwa Mine initially had been proposed in the early 1990s to provide fuel for the ferrochrome industry. In the mid-1990s, the Sengwa Mine was developed to be the source of fuel for the Government's Gokwe North power project, which was never built (Marawanyika, 2004§).

Coal-bed methane projects in western Zimbabwe included the Lubimbi exploration area that Hwange discovered in 2004 and the Lupane Gas Project for which the Industrial Development Corp. continued to seek development funding.

Petroleum.—The Government mulled the recommissioning of the country's former oil refinery at Feruka, which had closed in 1967 after the United Nations sanctions that were imposed on the former Government of Rhodesia resulted in the suspension of crude oil imports. The Feruka facility subsequently was converted to an oil storage terminal. The costs to rehabilitate and upgrade the remnants of the 40-year-old refinery were expected to be more than the cost of building a new refinery.

Outlook

The short-term outlook for the mining sector in Zimbabwe is not favorable. Currency regulations make it difficult for Zimbabwean companies, especially cement, coal, ferroalloys, gold, and steel operations, to benefit from the continued global trend of increased commodity prices. A residual effect of the rampant hyperinflation that continued to affect numerous mining operations adversely would be reduced equipment maintenance and deferred development exploration, both of which effectively shorten the potential operating lives of mines. Government intervention in the economy and in state-run industries has been a major contributor to the growing number of closed mines and suspended projects that are undermining the ability of the mining sector to continue to generate foreign export earnings.

The significant impact of the Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS)

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epidemic, which was estimated to affect 24.6% of the adult population in Zimbabwe, is expected to haunt the remaining workforce for years to come (Coorey and others, 2005, p. 6).

The Zimbabwe mineral sector remains attractive in the long term, especially for small- and medium-scale mining companies. The country has abundant mineral resources, and a well-developed infrastructure network remains in place. In the past dozen years, most of major multinational mineral commodity companies that had operations in Zimbabwe have withdrawn. New funding, primarily funneled through the cement, diamond, gold, and PGM sectors, has entered the country and prevented the total collapse of the minerals sector. Regional and small international companies continued to acquire Zimbabwean mining assets, especially in the gold sector, at what is hoped to be rock-bottom prices with the expectation that the economic climate will eventually improve. Platinum projects being undertaken by South African companies have been able to proceed with logistical support from South Africa to overcome fuel and other shortages.

References Cited

Anglo American plc, 2005, Annual report 2004: London, United Kingdom, Anglo American plc, 124 p.

Aquarius Platinum Ltd., 2005, Quarterly report 31 December 2004: Perth, Australia, Aquarius Platinum Ltd., 20 p.

Coorey, Sharmini, Heytens, Paul, Muñoz, Sònia, Mohapatra, Sanket, Andrews, Michael, Mbabazi-Moyo, Jennifer, and Ivaschenko, Oleksiy, 2005, Zimbabwe—Selected issues and statistical appendix: Washington, DC, International Monetary Fund Country Report No. 05/359, October, 116 p.

Graphit Kropfmühl AG, 2005, Annual report 2004: Hauzenberg, Germany, Graphit Kropfmühl AG, 54 p.

International Cement Review, 2004, Circle shut down for upgrade: International Cement Review, Building Bulletin, issue 72, April, p. 4.

Magnowski, Dan, 2004, Zimasco shuts furnaces but avoids force majeure: Metal Bulletin, no. 8839, April 26, p. 16.

Mining Journal, 2004, Zimbabwe releases draft BEE plans: Mining Journal, October 8, p. 1.

Muñoz, Sònia, 2005, High inflation and money demand, in Coorey and others, Zimbabwe—Selected issues and statistical appendix: Washington, DC, International Monetary Fund Country Report No. 05/359, October, p. 23-34.

Wankie Colliery Co. Ltd., 2004, Annual report 2003: Harare, Zimbabwe, Wankie Colliery Co. Ltd., 58 p.

White, David, 2004, Zimbabwe's golden free-for-all: Financial Times [London, United Kingdom], March 30, p. 10.

Zimbabwe Platinum Mines Ltd., 2005, Report for the quarter ended 31 December 2004: St. Peter Port, Guernsey, Zimbabwe Platinum Mines Ltd., 6 p.

Internet References Cited

Antwerp Facets News Service, 2004 (July 13), Rio Tinto shareholder approve controlling stake in Murowa, accessed July 14, 2004, at URL http://www.antwerpfacets.com/newsagency/detail.aspx?NewsLetterItemID=530.

Bain, Julie, 2004 (March 11), Wankie raises cash to boost coke supply, Business Day Online (Johannesburg), accessed December 12, 2004, at URL http://www.bday.co.za/bday/content/direct/1,3523,1566217-6094-0,00.html.

Bhasera, Synodia, 2004 (December 24), Cement price goes up again, The Financial Gazette, accessed July 26, 2005, at URL http://www.fingaz.co.zw/fingaz/2004/December/December24/7380.shtml.

Boese-O'Reilly, S., Dahlmann, F., Lettmeier, B., and Drasch, G., 2004 (November), Removal of barriers to the introduction of cleaner artisanal gold mining and extraction technologie in Kadoma, Zimbabwe—Part B—Health Assessment, accessed November 9, 2005, at URL http://www.unido.org/file-storage/download/?file_id=44429.

Dinidza Vermiculite Mining (Pvt.) Ltd., 2004, Dinidza mining operations, accessed July 26, 2005, at URL http://www.dinidza.com/mining.html.

Herald, The, 2004 (October 26), Hwange seeks US$25m to open new underground mine, accessed October 26, 2004, at URL http://allafrica.com/stories/printable/200410260766.html.

International Monetary Fund, 2005 (September), Zimbabwe, World Economic Outlook Database, accessed September 30, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.

Kadzere, Martin, 2004 (November 24), Ziscosteel needs proper turnaround, says industry captains, The Herald, accessed July 25, 2005, at URL http://www.zimbabweherald.com/index.php?id=38100&pubdate=2004-11-24.

Madiala, Ollie, 2005 (January 21), Miner to triple Zimbabwean, South African gold production, Mining Weekly, accessed January 24, 2005, at URL http://www.miningweekly.co.za/min/news/today/?show=61036.

Marawanyika, Godfrey, 2004 (January 16), Rio Tinto leases Sengwa Mine, Zambezi Times Online, accessed July 28, 2004, at URL http://metals.zambezitimes.com/me_fulltxt.php?id_news=1945.

Njini, Felix, 2004a (October 14), Murowa aims for full capacity, The Financial Gazette, accessed July 26, 2005, at URL http://www.fingaz.co.zw/fingaz/2004/October/October14/6774.shtml.

Njini, Felix, 2004b (September 30), ZESA—Wankie head for clash, The Financial Gazette, accessed November 8, 2005, via URL http://www.zimbabwesituation.com/sept20a_2004.html.

Reuters, 2004 (April 2), Harare's mining equity plans chills investors, halts ventures, accessed April 19, 2004, at URL http://www.zimbabwesituation.com/apr3_2004.html.

Shoko, D.S.M., and Veiga, M.M., 2004 (January), Information about the project sites in Zimbabwe, United Nations Industrial Development Organization, Global Mercury Project, accessed November 9, 2005, via URL http://www.unido.org/file-storage/download/?file_id=44427.

Zhuwakinyu, Martin, 2004 (July 30), Zim nickel-mine mulls big low-grade prospect, Mining Weekly, accessed August 3, 2004, at URL http://www.miningweekly.co.za/min/news/today/?show=54144.

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TABLE 1
ZIMBABWE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
METALS						
Chromite, gross weight		668,043	780,150	749,339	637,099	668,391
Cobalt, metal[2]		79	95	99	79	59
Columbium (niobium) and tantalum, mine output, Ta content		1	21	338	4	14
Copper:						
Mine output, concentrate, Cu content		2,104	2,057	2,502	2,767	2,383
Metal:						
Smelter output, blister/anode, primary[e]		14,500	2,160	--	--	--
Refinery output, refined/cathode, primary		10,200	8,000	7,200	7,200	7,000 [e]
Gold	kilograms	22,069	18,050	15,469	12,564	21,330
Iron and steel:						
Mine output, iron ore:						
Gross weight	thousand metric tons	451	361	272	367	283
Fe content[e]	do.	225	180	136	184	140
Metal:						
Pig iron	do.	277	156	122	131	150 [e]
Steel, crude	do.	258	149	105	152	180 [e]
Ferroalloys:						
Ferrochromium		244,379	243,534	258,164	245,299	193,077
Ferrosilicon chromium	thousand metric tons	20	17	--	--	1
Nickel:						
Mine output, concentrate, Ni content		8,160 [e]	10,120	8,092	9,516 [r]	9,776
Refinery output, refined metal:						
Refined from domestic materials		6,678	7,440	6,765	9,517	9,520 [e]
Toll refined from imported materials[3]		12,931	12,084	10,812	3,140	4,600 [e]
Total refined nickel metal		19,609	19,524	17,577	12,657	14,200 [e]
Platinum-group metals:						
Palladium	kilograms	366	371	1,943	3,449	3,564
Platinum	do.	505	519	2,306	4,270	4,438
Rhodium	do.	40	42	218	377	374
Ruthenium	do.	NA	NA	178	322	300
Iridium	do.	NA	NA	84	152 [r]	135
Osmium	do.	NA	NA	NA	NA	NA
Total		911	932	4,729	8,570 [r]	8,811
Silver	kilograms	3,799	3,449	1,711	747	3,216
INDUSTRIAL MINERALS						
Asbestos	thousand metric tons	152	136	168	147	104
Barite		5,032	7,464	--	--	--
Cement, hydraulic[e]	thousand metric tons	1,000	800	600	400 [r]	400
Clays[4]		589	2,247	3,789	--	500 [e]
Diamond	carats	23,028	--	--	--	44,454
Feldspar		2,059	1,055	591	246	1
Fluorspar		--	--	250	--	--
Gemstones:						
Amethyst	kilograms	10,376	840	NA	NA	NA
Emerald	do.	33	57	NA	NA	NA
Graphite		11,838	11,836	9,912	7,675	10,267
Kyanite		10,970	9,682	5,657	745	210
Lithium minerals, gross weight		37,914	36,103	33,172	12,131	13,710
Magnesite		4,029	2,439	2,366	1,333	749
Nitrogen, N content of ammonia		58,400	57,500	60,900	56,300 [r]	47,500
Perlite[e]		5,000	5,000	5,000	5,000	4,000
Phosphate rock, marketable concentrate		77,662	86,611	107,854	95,496	83,391

See footnotes at end of table.

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TABLE 1--Continued
ZIMBABWE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
INDUSTRIAL MINERALS--Continued						
Stone, sand and gravel:		130,000	385,532	408,550	190,372 [r]	8,825
Granite, black		1,500	3,799	3,169	922	41
Limestone	thousand metric tons	121 [e]	28	6,790	2,356	1
Silica[5]	do.					
Sulfur:						
Pyrite:		69,119	98,037	87,592	93,010	81,795
Gross weight		22,530	31,960	28,560 [r]	30,320 [r]	26,670
S content (32.6%)		2,500	2,000	2,000	2,000	1,900
Byproduct acid, metallurgical and coal process gas[e]		25,030	33,960	30,600 [r,e]	32,300 [r,e]	28,600 [e]
Total		989	1,273	911	196 [r]	--
Talc		16,215	11,632	23,803	20,016	27,150
Vermiculite						
MINERAL FUELS AND RELATED MATERIALS		3,809	4,064	3,721	2,872	2,476
Coal, bituminous	thousand metric tons	600	245	224	228 [r]	180 [e]
Coke, metallurgical [e]	do.					

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. NA Not available. -- Zero.

[1]Table includes data available through October 26, 2005.

[2]"Metal" includes metal content of compounds/salts and may include cobalt recovered from nickel-copper matte imported for toll refining.

[3]Toll-refined data includes part of the output from the Bindura Refinery and all of the production from the Empress Refinery, which processes imported nickel matte from Botswana.

[4]Includes fire clay.

[5]Includes rough and ground quartz and silica sand.

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The Mineral Industries of the Middle East

By Philip M. Mobbs, Glenn J. Wallace, David R. Wilburn, and Thomas R. Yager

The 15 nations of the Middle East that are covered in this volume encompass an area of more than 6 million square kilometers, which is about two-thirds the size of the United States and about 4% of the world's land mass. According to the World Bank Group (2005§[1]), in 2004, the total population of the Middle East region was estimated to be about 256 million compared with 294 million for the United States and 6.3 billion for the world. Production and processing of crude oil and natural gas were the foundations upon which the economies of most of the countries in the region (Bahrain, Iraq, Iran, Kuwait, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates, and Yemen) were based. Production of metals and industrial minerals in Iran and Turkey also was significant.

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For mineral production statistics—

- Bahrain—Ministry of Oil;
- Cyprus—Mines Service of the Ministry of Agriculture, Natural Resources, and Environment;
- Iran—Iranian Mines and Mining Industries Development and Renovation Organization;
- Israel—Mines Authority of the Ministry of National Infrastructures;
- Jordan—Natural Resources Authority;
- Qatar—Ministry of Energy and Industry; and
- Turkey—State Institute of Statistics.

For basic economic and population data—

- The International Monetary Fund and the World Bank Group in the United States.

General Economic Conditions

The Middle East was a major supplier of hydrocarbons to the world market. In the region, the economies of the oil-producing nations were buoyed and the economies of oil-import-dependant nations adversely affected by the continued high international market prices for crude oil and natural gas. Total exports of the nations that encircle the Persian Gulf were dominated by hydrocarbons. Much of the region's natural gas and oil export production was shipped to Asia.

The abundance of locally produced natural gas, access to ocean transportation, and the availability of low-cost electrical energy encouraged the construction of such value-added mineral facilities to the area as direct-reduced iron plants; energy-intensive mineral-processing operations, which included aluminum smelting; and petrochemical establishments, which included fertilizer plants. Expansion of the nonfuel minerals sector was supported by the national Governments of the region, which strongly endorsed the diversification of their respective economies into non-oil sectors.

The area's booming demand for consumer products was driven by the region's fast-growing, youthful population. The regional trend toward increased population and the increase in income associated with the high international oil prices spurred numerous construction sector projects; these included commercial office buildings, industrial (especially petrochemical) facilities, retail centers, residential housing, and the infrastructure necessary to support the new buildings and facilities.

Investment Data and Political Risk

State-owned companies dominated the Middle East's mineral industry, although foreign investment was finding its way into the mineral sector. Proposed construction or expansion projects in the region included an alumina refinery, aluminum smelters, ammonia and urea plants, cement plants, coke manufacturing plants, crude oil refineries, liquefied natural gas (LNG) plants, methanol plants, natural-gas-processing plants, and natural-gas-to-liquids facilities.

Government-funded expansion of copper mining and refining capacity continued in Iran, and additional iron-and-steel-processing facilities were proposed for several countries in the region. Progress was made on the privately funded development of copper reserves in Oman, foreign-investor- and Government-funded development of gold resources in Iran, internationally funded development of gold resources in Turkey, Government-funded development of gold resources in Saudi Arabia, foreign-investor-funded development of nickel resources in Turkey, Government-funded development of phosphate resources in Saudi Arabia, and Government- and internationally-funded development of zinc resources in Iran and Yemen.

The attempted reconstruction of Iraqi infrastructure and the continued international demand for minerals, especially natural gas and oil, fueled the continued domestic, foreign, and Government investment interest in the mineral operations in the area. Surplus petrodollars also found their way into general investments outside the region. In 2004, funds that originated in the Middle East accounted for about $1.2 billion of foreign investment that was provided to companies in the United States compared with $42 million from the Middle East in 2004 (Blustein, 2006).

Legislation

A new mining investment law was promulgated in Saudi Arabia in 2004. Changes in laws and regulations concerning foreign participation in the oil industry remained under discussion in Kuwait.

[1]References that include a section mark (§) are found in the Internet References Cited section.

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Exploration

Exploration activity was most notable in Iran, Turkey, and Yemen (see table 3). Industrial mineral and metal exploration and prospecting also were underway in Cyprus, Jordan, Oman, and Saudi Arabia. Local and international exploration companies were allowed to explore for minerals in most countries of the region. Government agencies engaged in mineral prospecting and general exploration included the Geological Survey of Iran, the Department of Geological Survey of the Directorate General of Minerals in Oman, the Saudi Geological Survey, the General Directorate of Mineral Research and Exploration in Turkey, and the Geological Survey and Mineral Resources Board of Yemen.

Crude oil and natural gas exploration was undertaken by Government and international oil companies. In 2004, hydrocarbon exploration continued in Bahrain, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, the United Arab Emirates, and Yemen.

Commodity Overview

he Middle East has significant reserves of boron minerals, crude oil, natural gas, and phosphate rock. Estimates for production of major mineral commodities for 2007 and beyond have been based upon supply-side assumptions, such as announced plans for increased production/new capacity construction and bankable feasibility studies. The outlook tables in this summary chapter show historic and projected production trends; therefore, no indication is made about whether the data are estimated or reported and revisions are not identified. Data on individual mineral commodities in tables in the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current (2004) producing facilities and on planned new facilities that operating companies, consortia, or Governments have projected to come online within indicated timeframes. Forward-looking information, which includes estimates of future production, exploration and mine development, cost of capital projects, and timing of the start of operations, are subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes. Projects listed in the following section are presented as an indication of industry plans and are not a USGS prediction of what will occur.

Metals

Alumina and Bauxite and Aluminum.—Regional aluminum production capacity was expected to increase by about 50% by 2007. By 2011, the planned construction of new potlines or expansion of existing production lines in Bahrain, Iran, Qatar, Saudi Arabia, and the United Arab Emirates was projected to increase regional aluminum capacity by about 140% compared with that of 2004. This capacity expansion was expected to greatly increase the region's alumina import requirements. In Saudi Arabia, the planned Az Zabirah project of the Saudi Arabian Mining Company (Ma'aden) would have the largest capacity of all the new aluminum projects in the region. Unlike most of the other aluminum projects in the region, which smelted imported alumina, the Az Zabirah project also included a mine to supply bauxite and a refinery to produce alumina. In Turkey, the proposed expansion of the Seydisehir aluminum smelter to 110,000 t/yr from 60,000 t/yr could be postponed again if the next attempt to privatize the smelter (in 2005) is successful (Mining Journal, 2001).

Copper, Gold, and Iron and Steel.—The Government of Iran's Fourth Five-Year Development Program (2005 to 2010) accounted for much of the region's planned expansion of copper ore (capacity expansions at the Dareh Zereshk and the Songun Mines), refined copper (expansion of the Sarcheshmeh Refinery), gold (development of the Zarshuran Mine), iron ore (capacity expansions at the Chadormalou, the Chah Gaz, the Gol-e-Gohar, the Kalal Abad-e Zarand, and the Sangan Mines), iron and steel (expansion of the Isfahan, the Khuzestan, and the Mobarekeh steel plants; construction of the Azarbayjan and the Hormozgan steel plants), lead and zinc ore, and zinc metal (Iranian Mines and Mining Industries Development and Renovation Organization, 2005).

Non-Iranian additions to projected regional output included that of Çayeli Bakir İşletmeleri A.Ş., which expected to produce, concentrate, and export additional copper from its mine in Turkey, and Saudi Arabian Mining Company (Ma'aden), which expected to increase gold production from the Al-Hajar and the Bulghah Mines and, in 2006, to start mining operations at the Al-Amar Mine.

Nickel.—In Turkey, European Nickel PLC proposed to start up a heap-leach operation at the Caldag deposit in 2007. The company planned to export (for additional processing) the nickel-cobalt hydroxide that it expected to recover.

Industrial Minerals

Phosphate Rock.—The Middle East region accounted for about 9% of the world's phosphate rock production in 2004. Initial production from the 1.4 million-metric-ton-per-year-capacity Al Jalamid deposit in Saudi Arabia was expected to begin in 2008. In Jordan, the planned expansion of the Shidiya Mine would significantly increase national production by 2011.

Mineral Fuels

International demand for crude oil, natural gas, and refined petroleum products and the continued surge in international prices for natural gas and oil during 2004 sustained the economies of the oil-producing nations of the region.

Natural Gas.—Natural gas production capacity was expected to be about 40% higher by 2011 compared with that of 2004. The continued development of the North Field, which is located offshore Qatar, and the South Pars gasfield, which is an extension of the North Field that is located offshore Iran, accounted for much of the capacity expansion.

Construction of several additional LNG trains in the Middle East region was planned, including the plants of the Pars LNG joint venture and the Persian LNG joint venture in Iran; the Oman Liquefied Natural Gas LLC plant and the Qalhat LNG

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Co. S.A.O.C. plant in Oman; Qatar Liquefied Natural Gas Co. Ltd.'s Qatar Gas II and III plants and Ras Laffan Liquefied Natural Gas Co. Ltd.'s Ras Laffan LNG trains 5, 6, and 7 in Qatar, and the Yemen LNG Co. Ltd. production facility in Yemen.

Petroleum.—The expectation that international interest would be focused on the natural gas exploration activities in Saudi Arabia was shattered after significant international attention was diverted to a controversy that concerned the long-term sustainability of Saudi oil production. The continued high international oil prices sustained the media interest in the dispute, which was primarily expounded by an analyst from the United States, about the production capacity and reserves of Saudi Arabian Oil Co. (Saudi Aramco) (Al-Husseini, 2004; Middle East Economic Digest, 2004; Takin, 2004, Morton, 2004§; Simmons, 2004§).

By late 2004, Iraq and Saudi Arabia reportedly were the only nations that had excess crude-oil production capacity. Crude oil production in Iraq was constrained by the sabotage of the oil facilities and pipelines, especially the northern pipeline to Turkey. Despite the international demand for crude oil, Saudi Arabia's high-sulfur-content heavy oil [27° to 29° API on the American Petroleum Institute (API) density scale], which comprised a significant portion of Saudi Aramco's excess capacity, remained difficult to sell. The Kingdom embarked on a program to increase production capacity to 12.5 million barrels per day (Mbbl/d), which would allow Saudi Arabia to maintain from 1.5 to 2 Mbbl/d of excess production capacity that could offset unexpected international supply disruptions. Most of the other planned increase in production capacity in the region was attributed to new oilfield development in Iran (Petroleum Economist, 2005; U.S. Energy Information Administration, 2004§).

In 2004, 5 of the 14 leading oil-producing nations were located in the Middle East. Saudi Arabia was ranked 1st in oil production in the world; Iran, 4th; the United Arab Emirates, 10th; Kuwait, 11th; and Iraq, 14th. Iran, Iraq, Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates were among the world's leading oil exporters (U.S. Energy Information Administration, undated a§).

In 2004, the countries of the Middle East accounted for about 24% of crude oil and 19% of total petroleum (crude oil and refined products) that the United States imported compared to 2003, when the region supplied 26% of U.S. crude oil and 21% of total petroleum imports.

The average free-on-board (f.o.b.) cost of crude oil imports entering the United States from Persian Gulf nations was $33.08 per barrel in 2004 compared with $25.17 per barrel in 2003, $23.38 in 2002, and $18.89 in 2001 (U.S. Energy Information Administration, 2006; undated b§, c§).

References Cited

Al-Husseini, Sadad, 2004, Rebutting the critics—Saudi Arabia's oil reserves, production practices ensure its cornerstone role in future oil supply: Oil & Gas Journal, v. 102, no. 19, p. 16-20.

Blustein, Paul, 2006, Mideast investment up in U.S.: Washington Post, The, March 7, 2006, p. A1, A9.

Iranian Mines and Mining Industries Development and Renovation Organization, 2005, Mines & mining in Iran: Tehran, Iran, Iranian Mines and Mining Industries Development and Renovation Organization, 195 p.

Middle East Economic Digest, 2004, Aramco refutes reserve charges: Middle East Economic Digest, v. 48, no. 10, March 5, p. 8.

Mining Journal, 2001, Turkish aluminum smelter expands: Mining Journal, v. 337, no. 8618, August 24, p. 147.

Petroleum Economist, 2005, Saudis drive regional production growth: Petroleum Economist, v. 72, no. 2, February, p. 20-21.

Takin, Manouchehr, 2004, Sustainable supply from Saudi Arabia, Iraq—Oil reserves or politics?: Oil & Gas Journal, v. 102, no. 14, April 12, p. 18-26.

U.S. Energy Information Administration, 2006, Table 9.2—F.O.B. costs of crude oil imports from selected countries: Washington, DC, U.S. Energy Information Administration, Monthly Energy Review, February, p. 124.

Internet References Cited

Morton, G.R., 2004 (August 16) Trouble in the world's largest oil field—Saudi Arabia's Ghawar, accessed September 1, 2004, at URL http://www.gasandoil.com/goc/news/ntm43590.htm.

Simmons, M.R., 2004 (September 9), Twilight in the desert—The fading of Saudi Arabia's oil, accessed February 28, 2006, via URL http://www.simmonsco-intl.com/Research.aspx?Type=MSSpeechArchives.

U.S. Energy Information Administration, 2004 (September), Persian Gulf oil and gas export fact sheet, accessed June 2, 2006, at URL http://www.eia.doe.gov/emeu/cabs/pgulf.html.

U.S. Energy Information Administration, [undated]a, Non-OPEC fact sheet, accessed May 24, 2006, at URL http://www.eia.doe.gov/emeu/cabs/topworldtables1_2.html.

U.S. Energy Information Administration, [undated]b, U.S. imports by country of origin—Crude oil, accessed May 24, 2006, at URL http://tonto.eia.doe.gov/dnav/pet/pet_move_impcus_a2_nus_epc0_im0_mbbl_m.htm.

U.S. Energy Information Administration, [undated]c, U.S. imports by country of origin—Total crude oil and products, accessed May 24, 2006, at URL http://tonto.eia.doe.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbbl_m.htm.

World Bank Group, 2005, World Development Indicators Database, accessed February 1, 2006, via URL http://www.worldbank.org.

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TABLE 1
MIDDLE EAST: 2004 AREAL EXTENT AND ESTIMATED POPULATION

Country	Area[1] (square kilometers)	Estimated population[2] (millions)
Bahrain	665	0.7
Cyprus	9,250	0.8
Iran	1,648,000	66.9
Iraq	437,072	25.3
Israel	26,990	10.3
Jordan	92,300	5.4
Kuwait	17,820	2.5
Lebanon	10,400	4.6
Oman	212,460	2.7
Qatar	11,437	0.6
Saudi Arabia	1,960,582	23.2
Syria	185,180	17.8
Turkey	780,580	71.7
United Arab Emirates	82,880	4.3
Yemen	527,970	19.4
Total	6,003,586	256.1
United States	9,631,418	293.5
World	148,940,000 [3]	6,345.1

[1]Source: U.S. Central Intelligence Agency, World Factbook 2004.

[2]Source: World Bank Group, World Development Indicators Database, July 2005.

[3]Land area.

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TABLE 2
MIDDLE EAST: GROSS DOMESTIC PRODUCT IN 2004

Country	Estimated GDP[1] based on purchasing power parity[2, 3] Total (billions)	Per capita	Real GDP annual percentage change[4]
Bahrain	$15	$18,817	5.4
Cyprus	16	19,633	3.7
Iran	519	7,594	5.6
Iraq[3]	90	3,500	52.3
Israel	145	22,077	4.4
Jordan	25	4,383	7.7
Kuwait	43	16,066	7.2
Lebanon	22	5,930	6.0
Oman	37	15,649	4.5
Qatar	22	28,919	9.3
Saudi Arabia	316	13,955	5.2
Syria	68	3,724	3.4
Turkey	530	7,503	8.9
United Arab Emirates	104	23,818	8.5
Yemen	18	736	2.5
Total	$1,970	$7,341	XX
United States	11,605	39,496	4.2
World	55,655	8,771	5.1

XX Not applicable
[1]Gross domestic product (GDP)
[2]Source: International Monetary Fund, World Economic Outlook Database, September 2005.
[3]Table data compiled February 1, 2006; may be different than what is presented in individual country chapters.
[4]Source: U.S. Central Intelligence Agency, World Factbook 2005.

TABLE 3
SELECTED MIDDLE EAST EXPLORATION ACTIVITY IN 2004

Country	Type[1]	Prospect	Commodity	Companies	Resource notes[2, 3]	Exploration notes
Iran	F	Mehdiabad	Zinc, lead, silver	Union Resources Ltd.[4]	15.6 Mt of zinc, 5 Mt of lead, 11,100 t of silver	Feasibility study underway.
Turkey	F	Çaldağ	Nickel, cobalt	European Nickel PLC	430,000 t of nickel, 200,000 t of cobalt	Feasibility study underway.
Do.	E	Çöpler	Gold	Anatolia Minerals Development Ltd.	45,000 kg of gold	Completed 12,000 meter drill program.
Yemen	F	Jabali	Zinc, silver	ZincOx Resources plc	1.1 Mt of zinc, 857 t of silver	Feasibility study underway.

[1]E--Active exploration. F--Feasibility work ongoing/completed.
[2]Resources reported where available based on data from various public sources. Data were not verified by the U.S. Geological Survey.
[3]Abbreviations used for units of measure in this table are as follows: kg--kilogram; Mt--million metric tons; and t--metric ton.
[4]Formerly Union Capital Ltd.

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TABLE 4

MIDDLE EAST: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2004[1]

(Thousand metric tons unless otherwise specified)

	Metals		Industrial minerals						Mineral fuels and related products	
									Petroleum	
Country	Aluminum, metal, primary	Chromite, mine output, gross weight	Steel, crude	Ammonia, N content	Cement, hydraulic	Gypsum	Phosphate rock, gross weight	Potash, K_2O equivalent	Crude, including condensate (thousand 42-gallon barrels)	Refinery products (thousand 42-gallon barrels)
Bahrain	532	--	--	311	153	--	--	--	13,600	92,700
Cyprus	--	--	--	--	1,689 [p]	255 [p]	--	--	--	1,700 [p]
Iran	213	139	8,382	1,088	32,198	12,594	230	--	1,400,000 [p]	545,000 [e]
Iraq	--	--	--	30 [e]	2,515	--	100 [e]	--	738,000	50,000 [e]
Israel	--	--	280 [e]	--	4,494	76	2,947	2,060	14	73,700
Jordan	--	--	135 [e]	--	3,908	135	6,223	1,210	8	29,500 [e]
Kuwait	--	--	--	413	1,600 [e]	--	--	--	880,000 [e]	306,000 [e]
Lebanon[e]	--	--	--	--	2,900	2	--	--	--	--
Oman	--	19	90 [e]	--	2,500 [e]	60 [e]	--	--	285,000	28,900
Qatar	--	--	1,046	1,428	1,400 [e]	--	--	--	287,000 [e]	42,300 [e]
Saudi Arabia	--	--	3,902	1,726	23,200 [e]	450 [e]	--	--	3,540,000 [2]	692,000 [e]
Syria[e]	--	--	70	162	5,450	370	2,883 [3]	--	196,000 [3]	83,200
Turkey	60 [e]	506	19,868	329	38,019	250	--	--	16,300	171,000
United Arab Emirates[e]	683	7 [3]	70	380 [3]	8,000	100	--	--	970,000	160,000
Yemen[e]	--	--	--	--	1,546 [3]	44	--	--	149,000	33,600
Total	1,490	671	33,800	5,870	130,000	14,300	12,400	3,270	8,470,000	2,310,000
Share of world total	4.9%	3.8%	3.2%	5.1%	6.0%	12.6%	8.9%	10.8%	31.2%	8.5%
United States	2,520	--	99,700	8,850 [4]	99,000	17,200	35,800	1,300	1,980,000	6,500,000
World total	30,300	17,700	1,040,000	116,000	2,150,000	114,000	140,000	30,200	27,200,000	27,100,000

[e]Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. [p]Preliminary. -- Zero or zero percent.

[1]Totals may not add due to independent rounding. Percentages are calculated on unrounded data. Table includes data available as of March 31, 2006.

[2]Includes natural gas liquids.

[3]Reported figure.

[4]Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.

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TABLE 5
MIDDLE EAST: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 1990-2011

(Metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	100,000	148,000	485,130	419,955	500,000	550,000	785,000
Saudi Arabia	--	--	--	--	--	--	2,800,000
Turkey	773,000	232,278	458,537	365,836	300,000	300,000	300,000
Total	870,000	380,000	944,000	786,000	800,000	850,000	3,900,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown.

TABLE 6
MIDDLE EAST: HISTORIC AND PROJECTED ALUMINUM PRODUCTION, 1990-2011[1]

(Metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Bahrain[1]	213,000	450,709	509,308	531,626	850,000	1,000,000	1,000,000
Iran	60,000	119,400	140,000	212,602	400,000	700,000	700,000
Qatar	--	--	--	--	--	--	285,000
Saudi Arabia	--	--	--	--	--	--	640,000
Turkey	61,000	61,514	61,000	60,000	110,000	110,000	110,000
United Arab Emirates	174,000	247,400	470,000	683,000	860,000	860,000	860,000
Total	510,000	879,000	1,180,000	1,490,000	2,200,000	2,700,000	3,600,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown.
[1]May include some secondary aluminum produced from used beverage cans.

TABLE 7
MIDDLE EAST: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 1990-2011[1]

(Metal content of concentrate in thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	66	102	125	150	150	200	300
Oman	14	--	--	--	10	20	20
Saudi Arabia	1	1	1	1	1	1	1
Turkey	33	24	70	40	50	60	60
Total	114	127	196	190	210	280	380

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. -- Negligible or no production.
[1]Copper content of mined ore (gross weight).

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TABLE 8
MIDDLE EAST: HISTORIC AND PROJECTED REFINED COPPER METAL PRODUCTION, 1990-2011[1]

(Metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Cyprus[2]	--	--	5,197	1,240	--	--	--
Iran	47,800	90,400	155,856	152,463	155,000	200,000	400,000
Oman	12,000	33,900	24,281	24,000	25,000	25,000	25,000
Turkey	84,200	100,300	64,100	50,000	50,000	50,000	50,000
Total	144,000	225,000	249,000	230,000	230,000	280,000	480,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. -- Negligible or no production.
[1]May include secondary.
[2]Electrowon.

TABLE 9
MIDDLE EAST: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 1990-2011

(Metal content of ore in kilograms)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	500	630	216	195	600	900	900
Oman	54	591	551	--	--	--	--
Saudi Arabia	3,540	8,080	3,800	9,000	12,000	20,000	22,000
Turkey	1,010	1,200	500	4,500	3,000	3,000	3,000
Total	5,100	10,500	5,100	14,000	16,000	24,000	26,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. -- Negligible or no production.

TABLE 10
MIDDLE EAST: HISTORIC AND PROJECTED IRON ORE MINE PRODUCTION, 1990-2011

(Metal content of ore in thousand metric tons)

Country	Average grade	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	49%	1,800	4,500	5,800	8,900	10,000	15,000	30,000
Turkey	53%	2,690	2,750	2,200	2,060	2,500	2,500	2,500
Total		4,500	7,300	8,000	11,000	13,000	18,000	33,000

[e]Estimated data are rounded to no more than three significant digits; may not add to rounded totals shown.

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TABLE 11
MIDDLE EAST: HISTORIC AND PROJECTED IRON PRODUCTION, 1990-2011

(Metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran							
DRI[1]	264,000	3,301,000	4,740,000	6,410,000	10,000,000	16,000,000	25,000,000
Pig iron	1,270,000	1,532,000	2,200,000	2,136,000	4,000,000	4,000,000	4,000,000
Total	1,534,000	4,833,000	6,940,000	8,546,000	14,000,000	20,000,000	29,000,000
Iraq, DRI[1]	170,000	--	--	--	--	--	--
Qatar, DRI[1]	580,000	622,000	620,962	830,000	850,000	870,000	900,000
Saudi Arabia, DRI[1]	1,090,000	2,129,000	3,090,000	3,410,000	3,900,000	4,400,000	4,400,000
Turkey, pig iron	4,830,000	330,070	300,000	213,210	300,000	400,000	400,000
Grand Total	8,200,000	7,910,000	11,000,000	13,000,000	19,000,000	26,000,000	35,000,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. -- Negligible or no production.
[1]Direct-reduced iron.

TABLE 12
MIDDLE EAST: HISTORIC AND PROJECTED STEEL PRODUCTION, 1990-2011

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	1,425	4,696	6,600	8,382	14,500	20,000	29,000
Iraq	150	300	50	--	--	--	--
Israel	144	200	270	280	350	350	350
Jordan	179	30	30	135	380	400	400
Oman	--	--	--	90	100	100	100
Qatar	580	614	744	1,046	1,200	1,500	1,500
Saudi Arabia	1,833	2,451	2,973	3,902	5,200	5,200	5,200
Syria	76	70	70	70	70	70	70
Turkey	9,322	12,744	14,325	19,868	20,000	22,000	25,000
United Arab Emirates	--	--	70	70	70	70	70
Total	13,700	21,100	25,100	33,800	42,000	50,000	62,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. -- Negligible or no production.

TABLE 13
MIDDLE EAST: HISTORIC AND PROJECTED LEAD MINE PRODUCTION, 1990-2011

(Metal content of concentrate in metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	11,000	15,900	18,000	22,000	25,000	35,000	40,000
Saudi Arabia	250	50	50	30	50	50	50
Turkey	11,000	1,196	8,500	9,100	9,000	9,000	9,000
Total	22,000	17,100	27,000	31,000	34,000	44,000	49,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. -- Negligible or no production.

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TABLE 14
MIDDLE EAST: HISTORIC AND PROJECTED PRIMARY REFINED LEAD PRODUCTION, 1990-2011

(Metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	--	4,000	15,000	17,857	18,000	18,000	18,000
Turkey	5,400	2,000	--	--	--	--	--
Total	5,400	6,000	15,000	18,000	18,000	18,000	18,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. -- Negligible or no production.

TABLE 15
MIDDLE EAST: HISTORIC AND PROJECTED SECONDARY REFINED LEAD PRODUCTION, 1990-2011

(Metric tons)

Country[1]	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	10,000	41,200	35,000	NA	35,000	35,000	35,000
Israel	--	8,200	13,000	27,000	27,000	27,000	27,000
Turkey	3,600	2,000	4,000	6,000	6,000	6,000	6,000
Total	14,000	51,000	53,000	33,000	68,000	68,000	68,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. NA Not available.
-- Negligible or no production.
[1]In addition to the countries listed, Saudi Arabia also produces secondary lead, but information is inadequate to estimate production.

TABLE 16
MIDDLE EAST: HISTORIC AND PROJECTED NICKEL PRODUCTION, 1990-2011

(Metal content of ore in metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Turkey	--	--	--	--	10,000	20,000	20,000
Total	--	--	--	--	10,000	20,000	20,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. -- Negligible or no production.

TABLE 17
MIDDLE EAST: HISTORIC AND PROJECTED ZINC MINE PRODUCTION, 1990-2011

(Metal content of ore in metric tons)

Country[1]	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	29,000	145,100	90,000	121,000	135,000	200,000	250,000
Saudi Arabia	2,470	500	3,000	1,500	2,000	3,000	3,000
Turkey	39,000	9,118	39,000	44,000	40,000	40,000	40,000
Total	71,000	155,000	132,000	167,000	180,000	240,000	290,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown.
[1]In Yemen, zinc ore with an estimated metal content of 40,000 metric tons (t) was expected to be produced in 2009. The volume was expected to increase to 75,000 t of zinc content in 2011. The ore will be treated hydrometallurgically and not concentrated.

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TABLE 18
MIDDLE EAST: HISTORIC AND PROJECTED ZINC METAL PRODUCTION, 1990-2011

(Metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	--	--	51,475	109,400	120,000	150,000	230,000
Turkey	21,100	17,050	--	--	--	--	--
Total	21,100	17,100	51,500	109,000	120,000	150,000	230,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. -- Negligible or no production.

TABLE 19
MIDDLE EAST: HISTORIC AND PROJECTED PHOSPHATE ROCK PRODUCTION, 1990-2011

(P_2O_5 content of ore in thousand metric tons)

Country	1999	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	NA	NA	20	28	20	30	40
Iraq	270	300	200	30	--	--	--
Israel	1104	1264	1305	940	1000	1000	1000
Jordan	2010	1655	1824	2050	2060	2060	2800
Saudi Arabia	--	--	--	--	--	1000	1400
Syria	511	477	646	850	1100	1100	1100
Total	3900	3700	4000	3900	4200	5200	6300

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. NA Not available. -- Negligible or no production.

TABLE 20
MIDDLE EAST: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Iran	1,440	1,640	2,002	2,498	2,500	3,000	3,200
Turkey	52,530	59,408	64,645	46,597	45,000	40,000	40,000
Total	54,000	61,000	66,500	49,100	48,000	43,000	43,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown.
[1]Includes anthracite, bituminous, and lignite.

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TABLE 21
MIDDLE EAST: HISTORIC AND PROJECTED NATURAL GAS PRODUCTION, 1990-2011

(Dry gas in million cubic meters)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Bahrain	6,000	7,205	8,966	9,194	9,000	8,000	7,000
Iran	23,800	36,600	60,200	89,663	100,000	120,000	130,000
Iraq	4,200	3,000	3,000	2,900	3,000	3,000	5,000
Israel	40	21	10	1,193	6,200	6,200	6,200
Jordan	--	30	289	294	540	540	540
Kuwait	5,200	9,280	9,600	9,600	10,000	10,000	10,000
Oman	3,000	3,015	12,020	17,000	20,000	20,000	20,000
Qatar	6,090	13,600	26,141	39,200	60,000	80,000	80,000
Saudi Arabia	30,800	38,030	49,668	68,000	75,000	85,000	85,000
Syria	1,200	2,900	3,886	7,000	12,800	12,800	12,800
Turkey	212	182	612	344	500	500	500
United Arab Emirates	23,800	31,320	39,800	46,000	45,000	45,000	45,000
Yemen[1]	--	--	--	--	--	5,000	10,000
Total	104,000	145,000	214,000	290,000	340,000	400,000	410,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown. -- Negligible or no production.
[1]Most produced natural gas in Yemen was stripped of liquids and reinjected or flared.

TABLE 22
MIDDLE EAST: HISTORIC AND PROJECTED CRUDE PETROLEUM (INCLUDING CONDENSATE) PRODUCTION, 1990-2011

(Thousand 42-gallon barrels)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Bahrain	15,900	14,468	13,766	13,647	13,500	13,000	12,000
Iran	1,130,000	1,329,700	1,360,000	1,399,000	1,500,000	1,600,000	1,600,000
Iraq	745,000	205,000	937,000	737,940	800,000	800,000	900,000
Israel	94	36	31	14	14	14	14
Jordan	116	20	13	8	8	8	8
Kuwait	428,000	752,265	766,000	880,000	900,000	900,000	900,000
Oman	250,000	311,300	353,000	285,385	350,000	350,000	300,000
Qatar	148,044	142,300	231,000	287,000	300,000	300,000	300,000
Saudi Arabia	2,545,000	3,260,300	3,247,000	3,538,300	4,000,000	4,000,000	4,000,000
Syria	140,000	222,650	202,000	196,200	151,000	144,000	137,000
Turkey	26,600	24,124	19,783	16,270	15,000	15,000	14,000
United Arab Emirates	773,000	800,500	815,000	970,000	1,000,000	1,000,000	1,000,000
Yemen	73,000	125,925	167,000	149,000	170,000	170,000	150,000
Total	6,270,000	7,190,000	8,110,000	8,470,000	9,200,000	9,290,000	9,310,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to rounded totals shown.

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The Mineral Industry of Bahrain

By Philip M. Mobbs

The island Kingdom of Bahrain had a total land area of about 665 square kilometers and supported a population of more than 707,000 on five main islands located in the Gulf of Bahrain between Qatar and Saudi Arabia. In 2004, the gross domestic product (GDP) based on purchasing power parity was estimated to be about $14.6 billion,[1] and the GDP per capita based on purchasing power parity was estimated to be $18,817. Revenue associated with the production of crude oil accounted for a significant segment of the economy. The aluminum sector also figured prominently in the country's mineral economy (Bahrain Monetary Agency, 2005a, p. 3; International Monetary Fund, 2005§[2]).

Trade

Of the country's total export earnings in 2004 of about $7.5 billion, Bahraini exports of crude oil and refined petroleum products were valued at about $5.5 billion compared with about $4.7 billion in 2003. In 2004, total national imports were valued at about $6.5 billion. In 2004, the Government signed a free trade agreement with the United States (Bahrain Monetary Agency, 2005b, p. 32).

Commodity Review

Metals

Aluminum.—In 2004, construction continued on Aluminium Bahrain B.S.C.'s (ALBA) fifth aluminum potline. Line 5, which had a design capacity of 307,000 metric tons per year (t/yr), was scheduled to be commissioned in early 2005. Construction of the proposed line 6, which had a design capacity of more than 300,000 t/yr and would use most of the remaining land at the ALBA site at Sitra, was under consideration. In 2004, the go-ahead decision on line 6 was deferred when Alcoa Inc. withdrew from an agreement to acquire 26% equity interest in ALBA (Middle East Economic Digest, 2005a).

Ferroalloys.—Bahrain Ferro Alloy Co. B.S.C. proposed to produce ferrochrome, ferromanganese, and silicomanganese at Hidd. The planned $57 million three-furnace ferroalloy facility would have a 90,000-t/yr capacity. The first 40,000-t/yr furnace was expected to be operational in March 2005 (Baby, 2004§).

Iron and Steel.—In 2004, United Stainless Co. was formed in Bahrain by Gulf Investment Corp. of Kuwait (30% interest), Qatar Steel Co. (25%), the National Industries Group of Kuwait (15%), United General Industrial Co. of Bahrain (15%), the Al-Rashid Group of Saudi Arabia (5%), Kuwait Foundry Co. (5%), and the Mohamed Abdulmohsin Kharafi Group of Kuwait (5%). Danieli & Co. SpA of Italy was awarded a $174 million contract by United Stainless to build a 90,000-t/yr capacity cold-rolled stainless steel mill that was scheduled to begin commercial operations in 2007 (Middle East Economic Digest, 2005b).

Mineral Fuels and Related Products

Kuwait Finance House Bahrain proposed to build a petrochemical, power, and water complex at Sitra. Proposed production would include about 500,000 t/yr of sodium hydroxide. The company discussed gas supply arrangements with the Government because the facility would require about 7 million cubic meters per year of natural gas, which would have to be imported from Iran or Qatar (Asian Chemical News, 2004).

Refined Petroleum Products and Sulfur.—In 2004, the Bahrain Petroleum Co. B.S.C. (Closed) (Bapco) proceeded with its $120 million refinery gas desulfurization (RGD) project, which would reduce hydrogen sulfide in the refinery's wastewater discharge and sulfur dioxide emissions from the refinery's stacks. The RGD included plans to install a 225-metric-ton-per-day-capacity sulfur recovery unit. Bapco also awarded contracts for the installation of a $658 million low sulfur diesel (LSD) production module, which would enable Bapco to meet upgraded international diesel fuel standards. The LSD program would reduce the sulfur content of Bapco's diesel production to two streams of 10 parts per million (ppm) and 50 ppm, respectively, compared with existing (2004) diesel output, which contained about 7,000 ppm sulfur (Bahrain Tribune, 2004§).

References Cited

Asian Chemical News, 2004, KFH plans Bahrain C2, EDC: Asian Chemical News, v. 10, no. 462, September 27, p. 19.

Bahrain Monetary Agency, 2005a, Economic indicators: Manama, Bahrain, Bahrain Monetary Agency, no. 7, March, 20 p.

Bahrain Monetary Agency, 2005b, Quarterly statistical bulletin: Manama, Bahrain, Bahrain Monetary Agency, June, 39 p.

Middle East Economic Digest, 2005a, Outgrowing the pot: Middle East Economic Digest, v. 49, no. 18, May 6, p. 37-38.

Middle East Economic Digest, 2005b, Usco moves to Hidd from UAE: Middle East Economic Digest, v. 49, no. 13, April 1, p. 17.

Internet References Cited

Baby, Soman, Gulf Daily News, 2004 (December 9), $57m ferro alloys firm in Bahraini jobs vow, accessed January 8, 2005, via URL http://www.gulf-daily-news.com.

Bahrain Tribune, 2004 (January 11), Bapco signs LSD plant deal, accessed February 23, 2004, at URL http://www.menafn.com/qn_news_story_s.asp?StoryId=38773.

International Monetary Fund, 2005 (April), Bahrain, World Economic Outlook Database, accessed May 3, 2005, via URL http://www.imf.org/external/pubs/ft/weo/ 2005/01/data/dbginim.cfm.

[1]Where necessary, values have been converted from Bahraini dinars (BhD) to U.S. dollars (US$) at the rate of BhD0.377=US$1.00.

[2]References that include a section mark (§) are found in the Internet References Cited section.

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TABLE 1

BAHRAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
Aluminum, smelter output, primary metal		509,038	522,749	518,924	531,991	531,626
Cement		88,806	88,700	66,986	129,256 r	153,483
Gas, natural:						
Gross	million cubic meters	11,500 e	12,018	12,154	12,305	12,130
Dry	do.	8,966	9,285	9,429	9,622 r	9,194
Methanol		370,000	412,122	405,763	370,008 r	398,406
Natural gas plant liquids:						
Propane	thousand 42-gallon barrels	1,055	1,058	1,099	1,021 r	1,032
Butane	do.	955	968	961	922 r	981
Naphtha	do.	1,626	1,598	1,610	1,647 r	1,786
Nitrogen, N content of ammonia		349,900	372,000	377,400	311,900	311,300
Petroleum:						
Crude[3]	thousand 42-gallon barrels	13,766	13,656	13,800	13,720	13,647
Refinery products:						
Liquefied petroleum gas	do.	346	353	350 e	350 e	350 e
Gasoline	do.	7,090	6,182	6,500 e	7,000 e	7,000 e
Jet fuel[e]	do.	9,450	15,497 4	16,000	16,000	16,000
Kerosene[e]	do.	9,000	2,777 4	3,000	5,000	5,000
Distillate fuel oil	do.	21,278	17,188	18,000 e	20,000 e	20,000 e
Residual fuel oil[e]	do.	29,000 4	25,000	26,000	29,000	29,000
Other[e]	do.	17,600	20,800 r	21,300 r	15,000	15,300
Total	do.	93,737 4	87,765 4	91,122 4	92,350 4	92,669 4
Sulfur		61,590	67,480	67,381	60,455 r	71,258

eEstimated; estimated data are rounded to no more than three significant digits and may not add to reported totals shown. rRevised.

[1]Table includes data available through August 19, 2005.

[2]In addition, iron ore was pelleted and exported for use by direct-reduction plants. Pellets were produced from imported iron ore. Granular urea has been produced from locally produced ammonia since 1998.

[3]Does not include production from the Abu Saafa Field.

[4]Reported figure.

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TABLE 2
BAHRAIN: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum:			
Metal	Aluminium Bahrain B.S.C. (Government of Bahrain, 77%; SABIC Industrial Investments, 20%; Breton Investments, 3%)	Smelter at Sitra	523,000 [1]
Rolled products	Gulf Aluminium Rolling Mill Co. B.S.C. (Closed) (Government of Bahrain, 38%; Saudi Basic Industries Corp., 30%; Industrial Bank of Kuwait, 17%; Gulf Investment Corp., 6%; Government of Iraq, 5%; Government of Oman, 2%; Government of Qatar, 2%)	Rolling mill at Sitra	145,000
Cement	Star Cement Co. W.L.L. (Emirates Trading Agency—Associated Constructions and Investments Co. L.L.C. of the United Arab Emirates, 100%)	Clinker grinding mill at Hidd	500,000
Iron ore, pellets	Gulf Industrial Investment Co. E.C. (Companhia Vale do Rio Doce of Brazil, 50%, and Gulf Industrial Investment Co. of Kuwait, 50%)	Pellet plant at Hidd	4,000,000
Methanol	Gulf Petrochemical Industries Co. B.S.C. (Government of Bahrain, 33.3%; Petrochemical Industries Co. of Kuwait, 33.3%; Saudi Basic Industries Corp., 33.3%)	Sitra	438,000
Natural gas:			
Extracted million cubic meters	Bahrain Petroleum Co., B.S.C. (Closed) (Government)	Bahrain Field, Ahwali	13,000
Liquids:			
Butane	Bahrain National Gas Co. B.S.C. [Bahrain Petroleum Co., B.S.C. (Closed), 75%; Arab Petroleum Investment Corp., 12.5%; Caltex Bahrain, 12.5%]	Natural gas plant at Ahwali	100,000
Naptha	do.	do.	180,000
Propane	do.	do.	120,000
Nitrogen:			
Ammonia	Gulf Petrochemical Industries Co. B.S.C. (Government of Bahrain, 33.3%; Petrochemical Industries Co. of Kuwait, 33.3%; Saudi Basic Industries Corp., 33.3%)	Sitra	438,000
Urea	do.	do.	621,000
Petroleum:			
Coke, calcined	Aluminium Bahrain B.S.C. (Government of Bahrain, 77%; SABIC Industrial Investments, 20%; Breton Investments, 3%)	do.	450,000
Crude thousand barrels	Bahrain Petroleum Co., B.S.C. (Closed) (Government)	Abu Saafa Field, offshore	110,000
Do. do.	do.	Bahrain Field, Ahwali	13,800
Refined products do.	do.	Sitra	95,600
Sulfur	do.	do.	72,000

[1]Completion of 307,000-metric-ton-per-year-capacity line 5 was expected in mid-2005.

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The Mineral Industry of Cyprus

By Philip M. Mobbs

The mineral industry of Cyprus[1] was dominated by the production of bentonite, cement, sand and gravel, and stone. Other mineral commodities produced included common clay, gypsum, and refined petroleum products for local use and copper, gypsum, ocher, perlite, and umber for export. Additional mineral-based processing activity on Cyprus included an aluminum extrusion plant, bronze and iron foundries, and plaster plants. In northern Cyprus, the mineral industry was dominated by the production of construction aggregates, stone, and umber.

In 2004, Cyprus' gross domestic product (GDP) at current prices was estimated to be $14.5 billion.[2] Mining and quarrying accounted for about 0.3% of the GDP. Real GDP increased at an annual rate of 3% compared with 2% in 2003. Cyprus' GDP based on purchasing power parity was estimated to be more than $15.4 billion in 2004, and the GDP per capita based on purchasing power parity was $19,224 (International Monetary Fund, 2005§[3]).

The island had an area of 9,250 square kilometers (km^2), of which 3,355 km^2 was in the area administered by Turkish Cypriots. The Greek Cypriot population was estimated to be about 776,000, and the Turkish Cypriot population was estimated to be about 210,000. In April, the United Nations' referendum on the unification of the two Cypriot states (known as the Annan Plan) was rejected by the Greek Cypriots by a margin of 3 to 1, and the proposed reunification of the divided Cyprus did not take place. A month later, a divided Cyprus became a member of the European Union (United Nations Security Council, 2004, p. 1-2; U.S. Central Intelligence Agency, 2004§).

Commodity Review

Metals

Copper.—Hellenic Copper Mines Ltd. copper production ceased in November. Because of unpaid wages, workers at the mine and solvent extraction-electrowinning facility at Skouriotissa went on strike in December. Operations remained suspended at yearend; the company was negotiating the sale of the business.

Eastern Mediterranean Minerals Ltd. of Cyprus (EMM), which was a joint venture of Oxiana Europe Ltd. of the Channel Islands (95%) and Hellenic Mining Co. of Cyprus (5%), continued to develop a geographic information systems database of Cyprus mineral occurrences with the British Geological Survey. In December, Eastern Mediterranean Resources Public Ltd., which was incorporated in Cyprus in September, agreed to acquire Oxiana's interest in EMM.

Mineral Fuels

In April 2004, Cyprus Petroleum Refinery Ltd. closed the country's petroleum refinery at Larnaca and began to convert its tank farm to a fuel import and storage center.

Outlook

In 2005, continued building and roadway construction in the north and the south is expected to maintain the strong domestic demand for cement, gypsum, sand and gravel, and stone. With the closure of the oil refinery, the country should easily be able to meet European Union standards for sulfur content of fuels with imports.

Reference Cited

United Nations Security Council, 2004, Report of the Secretary-General on his mission of good offices in Cyprus: New York, New York, United Nations Security Council Report S/2004/437, May 28, 27 p.

Internet References Cited

International Monetary Fund, 2005 (April), Cyprus, World Economic Outlook Database, accessed May 3, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

U.S. Central Intelligence Agency, 2004, Cyprus, World Factbook 2004, accessed July 6, 2004, at URL http://www.odci.gov/cia/publications/factbook/geos/cy.html.

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[1]Unless specifically stated, all data in this chapter are for the Republic of Cyprus in southern Cyprus because data related to the areas of northern Cyprus administered by Turkish Cypriots are sparse or unavailable. The two areas have been separated since 1974.

[2]Where necessary, values have been converted from Cypriot pounds (Cy£) to U.S. dollars (US$) at the average rate of Cy£0.469=US$1.00 for 2004 and CY£0.515=US$1.00 for 2003. Purchasing power parity valuation was based on the average rate of Cy£0.455=US$1.00 for 2004.

[3]References that include a section mark (§) are found in the Internet References Cited section.

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TABLE 1
CYPRUS: PRODUCTION OF MINERAL COMMODITIES[1, 2, 3]

(Thousand metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
Cement, hydraulic		1,398	1,369	1,438	1,637	1,689
Clays:						
Bentonite	metric tons	167,500	126,600	128,400	144,859	155,717
Other:						
For brick and tile manufacture		285	300	350	350 [e]	425
For cement manufacture		450	440	480	550	565
Total		735	740	830	900 [e]	990
Copper, refined[4]	metric tons	5,197	5,176	3,695	2,552	1,240
Gypsum, crude[5]	do.	260,000	250,000	295,000	300,000	255,000
Lime, hydrated	do.	6,800	9,400	12,190	13,370	13,990
Petroleum refinery products:[6]						
Liquefied petroleum gases	thousand 42-gallon barrels	345	359	378	330	80
Gasoline	do.	1,289	1,277	1,313	1,242	300
Kerosene and jet fuel	do.	285	288	281	301	70
Distillate fuel oil	do.	3,027	2,911	2,704	2,437	600
Residual fuel oil	do.	3,274	3,156	2,914	2,411	600
Asphalt and bitumen	do.	207	239	217	194	50
Other	do.	16	19	17	--	--
Total	do.	8,443	8,248	7,824	6,916	1,700
Stone, sand, gravel:						
Limestone, crushed (Havara)		1,800	1,500	2,000	1,000	1,200
Marble		2	2	2	2	1
Marl, for cement production		1,800	1,780	1,950	2,220 [r]	2,290
Sand and gravel[7]		8,800	9,300	10,500	10,700	11,600
Building stone[8]		80	55	80	103	105
Sulfur[e]	metric tons	1,400	1,400	1,300	1,300	300
Umber	do.	7,500	4,800	5,500	5,500	5,205

[e]Estimated; estimated data are rounded to no more than three significant digits. [p]Preliminary. [r]Revised. --Zero.

[1]Table includes data available through July 1, 2005.

[2]Small quantities of the mineral pigments ocher and terra verte are mined intermittently. Mineral production data from the area administered by Turkish Cypriots and production of fertilizers, perlite, and secondary metals from scrap are not included in this table because available information is inadequate to make estimates of output.

[3]Sources of data include company annual reports, the Mines Service, and the Statistical Service of Cyprus.

[4]Skouriotissa copper plant was closed in November 2004.

[5]About 4,000 metric tons per year of gypsum was calcined.

[6]Refinery closed in April 2004. Petroleum refinery products are rounded to the nearest thousand barrels; may not add to totals shown.

[7]Includes crushed aggregate.

[8]Includes crude, semifinished, and worked stone.

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TABLE 2
CYPRUS: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity	Major operating companies and and major equity owners	Location of main facilities	Annual capacity
Aluminum:			
Secondary	A & E Aluminium Recycling Ltd.	Nicosia	NA
Semimanufactures	Muskita Aluminum Industries Ltd.	Extrusion presses, Limassol	18,000
Cement	Vassiliko Cement Works Ltd.	Vassiliko	1,260,000
Do.	Cyprus Cement Co. Ltd.	Moni	400,000
Do.	Bogaz Endustri ve Madencilik	Near Famagusta, Northern Cyprus	150,000
Clay, bentonite	Peletico Penta Ltd.	Mines at Pentakomo and Troulli	300,000
Do.	Hellenic Mining Co.	NA	NA
Do.	Drapia Mining Co. Ltd.	Drapia, Monagroulli, and Parsata	(1)
Do.	Oryktako Ltd.	Mine at Kato Moni and processing plant at Malounda	10,000
Do.	C & A Quarries Ltd.	NA	NA
Copper, cathode	Hellenic Copper Mines Ltd.	Skouriotissa	(2)
Gypsum	Peletico Ltd.	Quarry and processing plant at Aradipou, near Larnaca	NA
Do.	Zeiplast Chemical Industries Ltd.	Near Moni	NA
Perlite	Peletico Ltd.	Expanded perlite facility at Larnaka	NA
Do.	Zeiplast Chemical Industries Ltd.	Expanded perllite facility at Moni	NA
Petroleum, crude	Cyprus Petroleum Refinery Ltd.	Larnaca	(3)
Steel, semimanufactures	B.M.S. Metal Pipes Industries Ltd.	Tube and pipe mill, Paphos	15,000

NA Not available.
[1]Inactive
[2]Production ceased in November 2004.
[3]Refinery closed in April 2004. Conversion of facility to petroleum product storage terminal began in 2004.

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The Mineral Industry of Iran

By Philip M. Mobbs

Iran's hydrocarbon sector, which included the production of natural gas and oil, the refining of crude oil, and the distribution of hydrocarbons, was a significant facet of the country's economy. In 2004, Iranian crude oil production averaged about 3.8 million barrels per day, and according to the U.S. Energy Information Administration (2005), Iran was the world's fourth leading producer of crude oil after Saudi Arabia, Russia, and the United States. The Central Bank of the Islamic Republic of Iran (2005, p. 34) reported that the average spot price of Iranian crude oil was $33.38 per barrel in 2004.

The International Monetary Fund (2005§[1]) reported that the real gross domestic product (GDP) increased by about 5.6% in 2004. The GDP based on purchasing power parity was estimated to be about $519 billion in 2004, and the GDP per capita based on purchasing power parity was about $7,600. The population of the 1.648-million-square-kilometer country was estimated to be about 69 million.

Structure of the Mineral Industry

The Ministry of Industries and Mines' authority covered all mining, smelting, and refining industries except the oil and gas sectors, which were administered by the Ministry of Petroleum. The Geological Survey of Iran performed initial geologic and mineral exploration and evaluation of the mineral resources (except hydrocarbons). Most of the country's active mines were privately owned, although the Government retained operational control of many of the larger mineral commodity companies, especially those that produced aluminum, ammonia, cement, coal, copper, iron and steel, natural gas and oil, salt, and sulfur.

Commodity Review

Metals

Chromium and Ferroalloys.—In 2004, chromite production rebounded when a number of inactive chromite mines resumed production; 38 mines were operational in 2004 compared with 20 in 2003. A 25,000-metric-ton-per-year (t/yr)-capacity high-carbon ferrochrome plant was under construction at Sabzevar in northeastern Iran for the Iran Minerals Producer & Supply Co. (a subsidiary of the state-owned Iranian Mines and Mining Industries Development and Renovation Organization). The new ferrochrome plant, which was scheduled to begin production in early 2005, was expected to consume about 78,000 t/yr of domestically produced chromite (Ministry of Industries & Mines, 2005§).

Ferrosilicon production also rebounded in 2004. Iran Ferrosilice Co. had suspended production in July 2003 while its 25,000-t/yr-capacity furnace in Semnan Province was overhauled. Production resumed in October 2003. Iran Ferroalloy Industries Co. proposed to increase the capacity of its ferrosilicon operations at Azna, Lorestan Province, to 45,000 t/yr from 25,000 t/yr (Iran Ferroalloy Industries Co., 2005§).

Copper and Molybdenum.—In December 2004, the state-owned National Iranian Copper Industries Co. (Nicico) officially opened the Meiduk copper mine. The mine was expected to produce 5 million metric tons per year (Mt/yr) of ore with a grade of 1% copper from which the Meiduk concentrator facilities were designed to produce 150,000 t/yr of copper concentrate with an average grade of 30% copper. Nicico's $245 million Khatounabad copper smelter also was commissioned in 2004. The 80,000-t/yr-capacity flash smelter was built by China Nonferrous Metal Industry's Foreign Engineering and Construction Co., Ltd. Copper anode output from the Khatounabad facility was to be refined at Nicico's Sarcheshmeh copper complex (Mining Journal, London, 2003).

Nicico continued to expand the capacity of the Sarcheshmeh copper mine to 21 Mt/yr of sulfide ore from 14 Mt/yr; concentrate production capacity was increased to about 540,000 t/yr of copper concentrate at an expected average grade of 28% copper from 372,000 t/yr at a grade of 30% to 32% copper, and molybdenum concentrate capacity was increased to 1,600 t/yr at a grade of 54% molybdenum. Expansion of the Sarcheshmeh copper refinery to 260,000 t/yr of copper cathode from a nominal design capacity of 150,000 t/yr also was underway. Nicico planned to evaluate further expansion of the Sarcheshmeh complex in 2005. The proposed Phase 2 expansion would increase mine output to 28 Mt/yr, copper concentrate production to 702,000 t/yr with a grade of 28% copper, and molybdenum concentrate to 6,000 t/yr with a grade of 54% molybdenum (Middle East Economic Digest, 2004f; National Iranian Copper Industries Co., undated a§, b§).

Development of the Songun copper mine and concentrator also continued. In 2005, Nicico expected to begin to mine about 7 Mt/yr ore with a grade of 0.67% copper at Songun and to produce 170,000 t/yr of concentrate with a grade of 30% copper (Middle East Economic Digest, 2004f).

The primary Sarcheshmeh facilities were designed to process sulfide ore. About 27 million metric tons (Mt) of oxide ore with an estimated grade of 0.61% copper had been stripped and stockpiled. The oxide stockpile was processed by a 12,000-t/yr-capacity solvent extraction-electrowinning (SX-EW) plant. Low-grade (about 0.6% copper) sulfide ores also were present at Sarcheshmeh. In 2004, the Council for Mineral Technology (Mintek) of South Africa and Nicico agreed to process about 60,000 metric tons (t) of the low-grade sulfide ore in a heap bioleach project; the resultant copper-bearing solution would be processed by a new SX-EW plant (Council for Mineral Technology, 2004§).

Copper World J.S.P. Co. of Tehran produced electrolytic-tough-pitch and fire-refined-high-conductivity copper rod

[1]References that include a section mark (§) are found in the Internet References Cited section.

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from copper scrap at its 36,000-t/yr-capacity plant. In 2004, the Outokumpu Group began construction of a 16,000-t/yr-continuous-casting system for Copper World (Outokumpu Group, 2004§).

Gold.—Much of the gold recovered in Iran was a byproduct of Nicico's Sarcheshmeh copper complex operations. Gold content of the copper ore was about 0.46 gram per metric ton (g/t). Additional gold ore was mined from the Mouteh Mine, the grade of which ranged from 2.5 to 4 g/t, and recovered from placer mines in the Neyshabour area (Iranian Mines and Mining Industries Development and Renovation Organization, 2005, p. 131).

Several gold exploration projects were underway; these included several prospects of Iran Mining Production & Supply Co., Persian Gold Plc. of the United Kingdom's exploration in the Takestan area, the evaluation of the Agh Darreh gold prospect in northwestern Iran by the Pouya Zarcan Agh Darreh Co. joint venture, Rio Tinto plc's work on the Sari Gunay project in Kordestan Province, and Zarmehr Gold Co. of Iran's work in Khorasan Province. The Geological Survey of Iran also evaluated several gold exploration prospects in 2004.

Iron and Steel.—The Government controlled much of the Iranian steel sector. At yearend 2003, six steel mills were privately owned. Another 11 small private steel mills, which were designed to produce a total of about 1.7 Mt/yr, were commissioned in 2004. A 1.6-Mt/yr hot-strip rolling mill was under construction in Rasht, Gilan Province, for Semnan Rolling & Tube Mills Co. The mill was expected to be operational in early 2005. The Government proposed to divest 50% of its interest in Isfahan Steel Mills, Khuzestan Steel Co., and Mobarekeh Steel Co. All three companies were subsidiaries of National Iranian Steel Co. (Metal Bulletin, 2004; Iran Daily, 2004i§; Tehran Times, 2005§).

Zinc.—In December, Mehdiabad Zinc Co. began a bankable feasibility study of the Mehdiabad zinc project. The owners proposed to produce zinc metal from a 160,000-t/yr-capacity zinc plant, which would process the deposit's oxide ore, and a 340,000-t/yr-capacity zinc plant, which would process sulfide ore (Union Resources Ltd. 2004).

Mineral Fuels

Natural Gas.—The Government proposed to increase Iranian natural gas production capacity to 300 billion cubic meters per year by 2014 from about 140 billion cubic meters per year in 2004. Most of the new production was to come from the offshore South Pars Field, which was the Iranian portion of Qatar's offshore North Field. A significant volume of natural gas produced onshore was reinjected into onshore oil reservoirs for pressure maintenance and to enhance recovery operations. Construction of infrastructure to capture the associated gas produced from offshore oilfields continued. Flaring of natural gas associated with offshore oil production in the Kharg and the Sirri regions was expected to end by 2008 (Iran Daily, 2004g§, h§).

The 25-million-cubic-meter-per-day Phase 1 gas plant of the multi-phase South Pars development project was inaugurated at Bandar Assaluyeh in 2004. Initial natural gas production from two offshore platforms, which were part of Phases 4 and 5 of the South Pars project, began in 2004. Completion of Phases 4 and 5 of the South Pars project, which included another gas plant at Bandar Assaluyeh, was expected in 2005. The annual output of the South Pars Phase 4 and 5 gas plant was expected to include about 1.05 Mt of liquefied petroleum gas, 145,000 t of sulfur, and 80,000 barrels of natural gas liquids (Iran Daily, 2004c§, f§; Rigzone.com, 2004§).

In 2004, Turkey again requested that the price of natural gas, which it imported from Iran under a long-term contract, be renegotiated. Iran concluded natural gas export negotiations with Armenia, which contracted to purchase 36 billion cubic meters of gas over a 20-year term. The construction of a 140-kilometer gas pipeline, which would link Armenia and Iran, began in November. The 1.1-billion-cubic-meter-per-year-capacity pipeline was expected to be completed in 2007. An expansion of the line to 2.3 billion cubic meters per year was proposed to be completed in 2019 (Dow Jones Newswires, 2004§).

Iran continued negotiations on natural gas exports to India, Kuwait, Pakistan, and the United Arab Emirates. Negotiations with Russia, Turkey, and Ukraine that covered the export of natural gas to Europe were proposed. In addition to the natural gas pipelines, several other natural gas export projects were under study; these included gas-to-liquids and liquefied natural gas (LNG) plants.

Economic evaluation of the 10-Mt/yr-capacity Pars LNG project, which was a venture of National Iranian Gas Export Co. [a subsidiary of state-owned National Iranian Oil Co. (NIOC)], Petroliam Nasional Bhd. (Petronas) of Malaysia, and Total S.A. of France, was expected to begin in 2005. The 10-Mt/yr-capacity Persian LNG project, which was a venture of NIOC, Repsol YPF S.A. of Spain, and the Royal Dutch/Shell Group, also was under study. In 2004, China agreed to purchase LNG from the proposed two-train 5-Mt/yr-capacity NIOC LNG project. Plans for the NIOC LNG projected that the initial LNG train would be operational in 2008 and the second, by 2013 (Middle East Economic Digest, 2004b, c).

Iran also imported about 10 million cubic meters per day of natural gas from Turkmenistan for use in northeastern Iran (Iran Daily, 2004b§).

Petroleum.—In response to higher international petroleum demand, Iranian production again increased, to about 1.4 billion barrels per year in 2004. The Government expected that the annual national oil production capacity would be increased to about 1.6 billion barrels by early 2005. Foreign direct investment in the oil sector for the fourth development plan (2005 to 2010) was expected to be about $31 billion. The Government also proposed to start up an oil trading facility, which would compete with the International Petroleum Exchange in London and the New York Mercantile Exchange, Inc (NYMEX) in New York. The Tehran oil exchange, which was expected to trade delivery and futures contracts for crude oil, petrochemicals, and refined petroleum products, was expected to be operational in 2006 (Middle East Economic Digest, 2004e; Iran Daily, 2004a§; Iranmania, 2004§).

As part of the Caspian Republics Oil Swap (CROS) program, which was inaugurated in April 2004, crude oil from

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Kazakhastan and Tukmenistan was shipped to Neka, Iran, and transported to the Tabriz and the Tehran oil refineries via the 170,000-barrel-per-day (bbl/d)-capacity Neka-Rey oil pipeline. An equivalent amount of Iranian oil was then shipped from oil ports in southern Iran for the Kazak and Turkmen companies. By late 2004, the CROS program suffered a temporary setback caused by widening pricing differences between the lighter Caspian crudes and the heavier Iran exports, when light Caspian oil was shipped to Europe, bypassing Iran (Agence France Presse, 2004§; Platts, 2004§).

In late 2004, the National Iranian Oil Refining & Distribution Co. (NIORDC) cancelled the proposed $500 million upgrade of the Tabriz and the Tehran oil refineries that was associated with the CROS program. The state-owned National Oil Engineering and Construction Co. considered building an additional crude oil refinery in northern Iran or reconfiguring existing refineries in Arak and Isfahan to refine surplus crude oil received under the CROS program. Iran's nine state-owned oil refineries were unable to meet domestic demand for motor vehicle fuels, which resulted in the country's importation of about 48 million barrels of gasoline in 2004. To address the increasing domestic fuel demand, which continued to outpace Government projections, and to meet European fuel quality standards, NIORDC proposed to build new refineries, to expand the production capacity of the Arak refinery to 250,000 bbl/d from 150,000 bbl/d, and to rehabilitate the Abadan, the Bandar Abbas, the Isfahan, and the Lavan Island refineries. In the past 5 years, the private sector has obtained permits to build 17 oil refineries; none of these refineries, however, has proved to be economical to construct (Middle East Economic Digest, 2004a, d, g, h; 2005; Iran Daily, 2004d§, e§).

The $70 million renovation at Bandar Abbas included expansion of the production capacity of both of the facilities' two crude distillation units to 160,000 bbl/d from 116,000 bbl/d and the installation of a new liquefied petroleum gas (LPG) recovery unit. NIORDC also began to evaluate the feasibility of expanding the Bandar Abbas refinery to 640,000 bbl/d. The proposed replacement of a fluid catalytic converter at the Isfahan refinery was expected to cost $1.5 billion, and the $40 million renovation of the Lavan Island refinery would include the installation of a new LPG unit (Middle East Economic Digest, 2004a, d, h).

In February, the Iraqi Oil Ministry reported that it was evaluating an Iranian proposal to build a 10-kilometer 250,000- to 350,000-bbl/d-capacity oil pipeline between Abadan, Iran, and Basra, Iraq (Hafidh, 2004§).

Additional coverage of the natural gas and petroleum industry of Iran is available from the U.S. Energy Information Administration (2005§).

Outlook

The Government's continued development of the nuclear reactor at Bushehr adversely affected the country's international relations. The stated objective of providing low-cost nuclear-powered electrical energy to the domestic Iranian market, which would allow natural gas and oil to be exported for income instead of burned for fuel in Iran, was overshadowed by international concern about the potential for the development of nuclear weapons in Iran.

More than 60% of Iranian oil production was exported in 2004. Oil production was expected to increase to supply domestic and international demand. The Government profited from the windfall as international oil prices remained at higher-than-expected levels. The state-owned oil companies were expected to continue to increase offshore and onshore petroleum exploration efforts, which would be supplemented in the future by funding and work by international firms. The development of identified natural gas and oil resources was expected to continue, subject to limitations imposed by the economic sanctions of the United States, which prohibited companies and persons from the United States from performing services or supplying goods or technology that would benefit the Iranian oil industry. With only 18 of the proposed 28 segments of the South Pars natural gas development project started, the project was expected to continue for a number of years. New construction and renovation of existing oil refineries was expected to begin during the next 5-year plan (2005 to 2010).

Unlike many oil-dominated economies, Iran had diversified its oil-based economy. Numerous development or expansion projects were underway in the metals sector, especially in the aluminum, copper, ferroalloys, gold, iron and steel, and zinc industries. In the industrial minerals sector, development or expansion projects in the cement, magnesium, potash, and stone industries also were expected to be completed in the next 5 years.

References Cited

Central Bank of the Islamic Republic of Iran, 2005, Annual review—1383—(2004/05): Tehran, Iran, Central Bank of the Islamic Republic of Iran, 75 p.

Iranian Mines and Mining Industries Development and Renovation Organization, 2005, Mines & mining in Iran: Tehran, Iran, Iranian Mines and Mining Industries Development and Renovation Organization, 195 p.

Metal Bulletin, 2004, Opening up Iran: Metal Bulletin, no. 8871, December 6, p. 8-11.

Middle East Economic Digest, 2004a, Bids due for Bandar Abbas upgrade: Middle East Economic Digest, v. 48, no. 12, March 19, p. 10.

Middle East Economic Digest, 2004b, Chinese enter LNG fray with NIOC deal: Middle East Economic Digest, v. 48, no. 13, March 26, p. 16.

Middle East Economic Digest, 2004c, FEED launch for integrated Pars LNG scheme: Middle East Economic Digest, v. 48, no. 50, December 10, p. 12.

Middle East Economic Digest, 2004d, Isfahan revamp kickstarts refinery upgrade: Middle East Economic Digest, v. 48, no. 18, April 30, p. 12.

Middle East Economic Digest, 2004e, New reserves boost quota claims: Middle East Economic Digest, v. 48, no. 28, July 9, p. 11.

Middle East Economic Digest, 2004f, Nicico plans expansion study: Middle East Economic Digest, v. 48, no. 50, December 10, p. 23.

Middle East Economic Digest, 2004g, NIORDC cancels Tehran and Tabriz upgrades: Middle East Economic Digest, v. 48, no. 52, December 24, p. 16.

Middle East Economic Digest, 2004h, Six price refinery upgrade: Middle East Economic Digest, v. 48, no. 26, June 25, p. 12.

Middle East Economic Digest, 2005, Interest called for Arak refinery: Middle East Economic Digest, v. 49, no. 1, January 7, p. 10.

Mining Journal, London, 2003, Meydouk progresses concentrator: Mining Journal, v. 340, no. 8721, January 31, p. 75.

Union Resources Ltd. 2004, Australia's Union Resources starts feasibility study on Iranian zinc deposit: Brisbane, Australia, Union Resources Ltd., December 9, 1 p.

U.S. Energy Information Administration, 2005, Table 11—World crude oil production, in Monthly Energy Review: Washington, DC, U.S. Energy Information Administration, July, p. 150-151.

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Internet References Cited

Agence France Presse, 2004 (November 14), Iranian oil swap with Caspian states hit by high prices of light crude, accessed November 15, 2004, at URL http://www.turkishpress.com/news.asp?ID=33674.

Council for Mineral Technology, 2004 (May 5), Mintek and NICICO to demonstrate copper heap bioleach process, accessed May 6, 2004, at URL http://www.mintek.co.za/info/newsreleases/nicico_bioleach.htm.

Dow Jones Newswires, 2004 (December 1), Construction begins on gas pipeline from Iran to Armenia, accessed December 2, 2004, at URL http://www.slb.com/news.story.cfm?storyid=623120.

Hafidh, Hassan, Dow Jones Newswires, 2004 (February 18), Iraq mulling building 250,000 b/d oil pipeline with Iran, accessed February 18, 2004, at URL http://www.biz.yahoo.com/djus/040218/08288000427_2.html.

International Monetary Fund, 2005 (September), Iran, World Economic Outlook Database, accessed September 30, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.

Iran Daily, 2004a (January 19), 4th plan projects $81bn in oil revenues, accessed January 20, 2004, at URL http://www.iran-daily.com/1.

Iran Daily, 2004b (October 9), 10m cu.m of Turkmen gas imported daily, accessed October 11, 2004, via page 3—Domestic Economy, at URL http://www.iran-daily.com/1383/2108/html/pdf.php.

Iran Daily, 2004c (July 25), 85% progress in South Pars project, accessed July 26, 2005, at URL http://www.iran-daily.com/daily.shtml.

Iran Daily, 2004d (January 19), Feasibility studies underway on northern refinery, accessed January 20, 2004, at URL http://www.iran-daily.com/1.

Iran Daily, 2004e (May 11), Is oil refining economical, accessed December 28, 2005, at URL http://www.iran-daily.com/1384/2271/html/focus.htm.

Iran Daily, 2004f (November 21), Khatami inaugurates South Pars 1 gas plant, accessed January 12, 2005, at URL http://www.iran-daily.com/1383/2144/html/index.htm.

Iran Daily, 2004g (October 27), Major increase in gas production planned, accessed November 4, 2004, at URL http://www.iran-daily.com/1383/2124/html/pdf.php.

Iran Daily, 2004h (September 23), Offshore gas burning will stop in 3 years, accessed September 22, 2004, at URL http://www.iran-daily.com/top.html.

Iran Daily, 2004i (November 25), SEC okays steel privatization initiative, accessed January 12, 2005, at URL http://www.iran-daily.com/1383/2148/html/economy.

Iran Ferroalloy Industries Co., 2005 (April 23), History of Iran Ferroalloy Industries Co., accessed December 19, 2005, at URL http://www.ferroazna.com/en/index.php.

Iranmania, 2004 (December 28), Oil bourse closer to reality, accessed December 27, 2005, at URL http://www.iranmania.com/News/ArticleView/Default.asp?NewsCode=28176&NewsKind=Business & Economy.

Ministry of Industries & Mines, 2005 (April 11), Sabzevar ferrochrome project to become operational tomorrow, accessed April 15, 2005, at URL http://www.intl.mim.gov/ir/news.aspx?ID2=807.

National Iranian Copper Industries Co., [undated] a, Sarcheshmeh concentrator, accessed December 20, 2005, at URL http://www.nicico.ir/portal/Home/Default.aspx?CategoryID=dcf92413-44c7-4805-95d2-beb0b5939ed6.

National Iranian Copper Industries Co., [undated] b, Sarcheshmeh copper complex, accessed December 20, 2005, at URL http://www.nicico.com/sar-exp.htm.

Outokumpu Group, 2004 (May 3), Outokumpu to deliver new copper rod plant in Iran, accessed January 24, 2005, at URL http://www.outokumpu.com/pages/Page_10801.aspx?mode=print.

Platts, 2004 (April 21), First phase of Iran Caspian oil swap deal to start in ten days—TV, accessed April 21, 2004, at URL http://www.platts.com/Oil/News/2585448.xml?S=n.

Rigzone.com, 2004 (October 28), Eni begins production at South Pars gas field offshore Iran, accessed October 29, 2004, at URL http://www.rigzone.com/news/article.asp?a_id=17640.

Tehran Times, 2005 (October 24), 4 private steel companies to come on stream this year, accessed October 26, 2005, via URL http://www.tehrantimes.com/archives/Description.asp?Da=10/24/2005&Cat=9&Num=14.

U.S. Energy Information Administration, 2005 (March), Iran, Country Analysis Brief, accessed July 1, 2005, at URL http://www.eia.doe.gov/emeu/cabs/iran.html.

Major Sources of Information

Geological Survey of Iran
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TABLE 1
IRAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004[p]
METALS						
Aluminum:						
Bauxite, gross weight		485,130 [r]	273,677 [r]	57,254 [r]	365,837 [r]	419,955
Alumina		--	--	101,339 [r]	102,785 [r]	137,002
Metal, primary ingot		140,000 [e]	146,000 [r]	168,715	182,477 [r]	212,602
Arsenic, orpiment and realgar, concentrates[e]		400	400	400	275 [r]	89 [4]
Chromite, mine output, concentrate						
Gross weight		161,138 [r]	145,170 [r]	512,640	97,328 [r]	138,755
Cr_2O_3 content[e]		79,000 [r]	69,000 [r]	250,000	48,000 [r]	68,000
Copper:						
Mine output:						
Ore mined (0.6% to 1.2% Cu):						
Gross weight	thousand metric tons	14,413 [r]	16,140 [r]	15,529 [r]	15,084 [r]	18,885
Cu content[e]		150,000 [r]	170,000 [r]	160,000 [r]	160,000 [r]	190,000
Concentrate (29% to 35% Cu):						
Gross weight		381,841 [r]	414,133 [r]	394,061 [r]	395,036 [r]	448,689
Cu content[e]		125,000	121,000	121,000	130,000	150,000
Metal:						
Smelter output, blister/anode		181,238 [r]	181,526 [r]	171,591 [r]	168,613 [r]	184,814
Refined output, cathode		155,856 [r]	152,703 [r]	143,438 [r]	145,669 [r]	152,463
Gold, mine output, Au content[5]	kilograms	216 [r]	192 [r]	210 [r]	203 [r]	195
Iron and steel:						
Ore and concentrate:						
Gross weight	thousand metric tons	12,370	13,978 [r]	16,906 [r]	18,287 [r]	18,205
Fe content[e]	do.	5,800 [r]	6,400 [r]	8,000 [r]	9,000 [r]	8,900
Metal:						
Pig iron[e]	do.	2,200	2,300	2,400	2,709 [r, 4]	2,136 [4]
Direct-reduced iron	do.	4,740	5,000 [e]	5,280	5,620	6,410
Ferrochromium[e]		11,505 [4]	8,430	8,000	10,000	7,750 [4]
Ferrosilicon[e]		40,000	40,000	40,000	40,297 [r, 4]	50,140 [4]
Steel, crude, ingots and castings	thousand metric tons	6,600 [e]	6,890	7,293	7,869	8,382
Lead:						
Mine output, concentrate:						
Gross weight		35,590 [r]	39,093 [r]	38,054 [r]	39,093 [r]	42,018
Pb content[e]		18,000 [r]	19,000 [r]	19,000 [r]	20,000 [r]	22,000
Refinery output, includes secondary[e]		50000	53,000	50,000	11,342 [r, 4]	17,857 [4]
Manganese, mine output, (30% to 35% Mn):						
Gross weight		105,000 [e]	120,994	123,148	115,680 [r]	128,924
Mn content[e]		32,000	40,000 [r]	42,000 [r]	38,000 [r]	43,000
Molybdenum, mine output, concentrate:						
Gross weight		3,543 [r]	4,506 [r]	4,271 [r]	4,084 [r]	3,367
Mo content[e]		1,900 [r]	2,400 [r]	2,300 [r]	2,200 [r]	1,800
Silver, mine output, Ag content		22	22	23	23	25
Zinc:						
Mine output, concentrate:						
Gross weight		182,000	250,000 [r]	220,000 [r]	222,000 [r]	244,006
Zn content[e]		90,000	120,000	120,000	110,000 [r]	121,000
Metal		51,475 [r]	73,000	82,571 [r]	78,428 [r]	109,400

See footnotes at end of table.

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TABLE 1--Continued
IRAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004[p]
INDUSTRIAL MINERALS						
Asbestos:						
Concentrate, (3% to 8% marketable fiber)		65,900 [r]	75,000 [r]	70,000 [r]	9,816 [r]	82,018
Marketable fiber[e]		2,000	2,000	1,500	1,470 [r, 4]	6,000
Barite		243,868 [r]	195,539	178,652	196,169 [r]	275,607
Boron, borax		2,755 [r]	3,212	2,079	3,361 [r]	2,142
Cement, hydraulic	thousand metric tons	23,880	26,640	28,600	30,460 [r]	32,198
Clays:						
Bentonite		163,364 [r]	113,299 [r]	125,510 [r]	140,528 [r]	193,046
Industrial clays[e]		450,000	485,000 [4]	490,000	490,000	500,000
Kaolin		605,910 [r]	635,888 [r]	553,782 [r]	484,501 [r]	531,109
Diatomite		2,000 [r]	-- [r]	1,879 [r]	9,500 [r]	8,028
Feldspar		156,000	204,078	191,316	242,898 [r]	252,713
Fluorspar		25,302 [r]	35,986	32,006	41,094 [r]	41,220
Gemstones, turquoise[e]	kilograms	20,000	20,000	20,000	20,000	20,000
Gypsum	thousand metric tons	10,427 [r]	10,382 [r]	13,535 [r]	13,828 [r]	12,594
Industrial or glass sand (quartzite and silica)[e]		1,000,000	1,700,000	1,700,000	1,700,000	1,700,000
Lime	thousand metric tons	41,821 [r]	41,026 [r]	42,620 [r]	46,170 [r]	52,804
Magnesite		141,000 [e]	133,778	128,565	87,795 [r]	88,194
Mica		3,606 [r]	3,255	2,845	5,500 [r]	7,032
Nepheline syenite		--	6,650	75,000	75,500	63,798
Nitrogen:						
N content of ammonia		965,000	1,086,700	1,119,100	1,115,100 [r]	1,087,700
N content of urea		624,000 [e]	651,000 [e]	732,700 [r]	734,200 [r]	717,800
Perlite		28,000 [r]	18,130 [r]	20,000 [r]	26,495 [r]	31,259
Phosphate rock:						
Ore		169,331	213,338	303,000	194,000	229,575
P_2O_5 content[e]		20,000	26,000	36,000	23,000	28,000
Pigments, mineral, natural iron oxide, ochre[e]		13,500	1,000 [r, 4]	2,300 [r, 4]	2,300	2,500
Pumice and related volcanic materials[e]		150,000	760,000 [4]	810,000	1,200,000	1,200,000
Salt		1,984,931 [r]	1,558,668 [r]	1,664,496 [r]	2,002,899 [r]	1,790,669
Soda ash[e]		120,000	120,000	120,000	120,000	120,000
Sodium compound, caustic soda[e]		20,000	20,000	22,000	22,000	22,000
Stone:						
Construction and building, crushed[6]	thousand metric tons	11,783 [r]	16,450 [r]	19,809 [r]	21,383 [r]	25,369
Dimension and decorative:						
Granite	do.	247 [r]	401 [r]	620 [r]	838 [r]	1,019
Marble, blocks and slabs[7]	do.	2,970 [r]	3,460 [r]	3,462 [r]	4,014 [r]	4,068
Travertine, blocks	do.	574 [r]	678 [r]	728 [r]	935 [r]	1,360
Total	do.	3,790 [r]	4,540 [r]	4,810 [r]	5,790 [r]	6,450
Dolomite	do.	303 [r]	223 [r]	439 [r]	522 [r]	600
Limestone[e]	do.	35,000	41,800	41,100	41,100	43,000
Strontium, celesite[e]		2,000	2,000	2,000	2,100 [r, 4]	7,500 [4]
Sulfates, natural:[e]						
Aluminum potassium sulfate (alum)		12,000	10,000	10,000	1,000	1,000
Sodium sulfate		420,000 [4]	387,000 [4]	580,000	580,000	600,000
Sulfur:[e]						
Byproduct of petroleum and natural gas		963,000	880,000 [4]	1,200,000 [4]	1,310,000	1,400,000
Byproduct of metallurgical processing, S content of acid		50,000	50,000	50,000	50,000	60,000
Total		1,010,000	930,000 [r]	1,250,000	1,360,000	1,460,000
Talc		26,741 [r]	60,282 [r]	68,007 [r]	57,000 [r]	108,541

See footnotes at end of table.

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TABLE 1--Continued
IRAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004[p]
MINERAL FUELS AND RELATED MATERIALS						
Coal	thousand metric tons	2,002 [r]	1,981 [r]	2,076 [r]	1,902 [r]	2,498
Coke	do.	1,152 [r]	1,095 [r]	1,055 [r]	1,004 [r]	1,021
Gas, natural:[e]						
Gross	million cubic meters	120,000	120,000	120,000	125,000	137,000
Dry	do.	60,200 [r]	66,000 [r]	75,000 [r]	81,500 [r]	89,663 [4]
Plant liquids	thousand 42-gallon barrels	25,000	25,000	25,000	25,000	25,000
Petroleum:						
Crude	do.	1,360,000	1,350,000	1,250,000	1,366,000 [r, 4]	1,399,000 [4]
Refinery products:[e]						
Liquefied petroleum gases	do.	16,000	16,000	16,000	16,000	17,000
Motor gasoline	do.	65,000	67,000 [r]	67,000 [r]	67,000 [r]	68,000
Jet fuel	do.	12,000	13,000 [r]	14,000 [r]	14,000 [r]	14,000
Kerosene	do.	40,000	44,000 [r]	46,000 [r]	46,000 [r]	46,000
Distillate fuel oil	do.	140,000	130,000 [r]	135,000 [r]	140,000	140,000
Residual fuel oil	do.	160,000	145,000 [r]	152,000 [r]	160,000	160,000
Other	do.	67,000	65,000 [r]	95,000 [r]	100,000	100,000
Total	do.	500,000	480,000 [r]	525,000 [r]	543,000 [r]	545,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. -- Zero.

[1]Table includes data available through November 1, 2005.

[2]Data are for Iranian years ending March 21 of that stated, except data for alumina, natural gas, natural-gas-plant liquids, and petroleum, which are for Gregorian calendar years.

[3]In addition to commodities listed, the following may have been produced, but information is inadequte to estimate output: antimony, bromine, ferromolybdenum, nepheline syenite, phosphate rock, selenium, shell, silicomanganese, vermiculite, and zeolite.

[4]Reported figure.

[5]Includes gold recovered from the Mouteh gold mine and from the Sarcheshmeh copper complex.

[6]Includes marble and travertine.

[7]Includes marmarite.

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The Mineral Industry of Iraq

By Philip M. Mobbs

In 2004, Iraq attempted to recover from the post-conflict insurgency that has engulfed the country since 2003. Problems with power availability, security, and transportation adversely affected the nation. Rehabilitation of the country's industrial sector, especially mineral fuel production and processing, and associated infrastructure slowly continued. Attacks by insurgents on electricity generation and distribution facilities hampered attempts to restore electrical power to the country. The lack of electrical power resulted in an increased demand for petroleum products to fuel small electrical generators, and attacks by insurgents on oil facilities resulted in decreased flow of crude oil to export terminals and domestic refineries. The resultant crude oil supply problems and the frequent power outages adversely affected domestic petroleum refineries, which resulted in a shortage of locally-produced petroleum products. The Government was forced to import about $2.6 billion worth of refined petroleum products to cover domestic demand. In 2004, increased car bomb attacks in urban areas also significantly escalated the demand for cement and glass (International Monetary Fund, 2005, p. 14).

Iraq's gross domestic product (GDP) based on purchasing power parity was estimated to be about $54.4 billion in 2004, and the GDP per capita based on purchasing power parity was estimated to be $2,100. In 2003 (the latest year for which detailed data were available), nearly 53% of the GDP was attributed to the crude oil sector. With the exception of cement, production of other mineral and mineral-based commodities was negligible (International Monetary Fund, 2005, p. 3; U.S. Central Intelligence Agency, 2005§[1]).

Trade

In 2004, crude oil exports of almost 541 million barrels were valued at $17.3 billion. Iraq's other exports were valued at $452 million. Total Iraqi imports were valued at $19.6 billion (International Monetary Fund, 2005, p. 14, 15).

In 2004, an average of 656,000 barrels per day (bbl/d) of exported Iraqi crude oil reached the United States; this volume accounted for more than 42% of total Iraqi crude oil exports and about 5% of gross U.S. crude oil imports. The United States had imported an average of 481,000 bbl/d from Iraq in 2003, 459,000 bbl/d in 2002, and 795,000 bbl/d in 2001 (U.S. Energy Information Administration, 2005a, b).

Government Policies and Programs

The Foreign Direct Investment Law of 2003 restricted foreign ownership in the production of minerals and oil and initial processing. In May 2004, the Coalition Provisional Authority returned full control of the Iraqi industrial sector to the Ministry of Industry and Minerals.

Commodity Review

Industrial Minerals

Nitrogen.—In early 2004, ammonia and urea production resumed at the Khor al-Zubair plant of the General Co. for Fertilizer (Middle East Economic Digest, 2004).

Mineral Fuels

Natural Gas.—Iraq's oil companies flared about one-third of the natural gas they extracted, most of which was associated with oil production. The Government proposed to exploit two undeveloped gasfields in 2005 and agreed to supply about 991,000 cubic meters per day of natural gas to Kuwait by October 2005 (Gulf News, 2004§; Kuwait Ministry of Oil, 2004§).

Petroleum.—In December, the Iraqi Ministry of Oil awarded a contract to develop the Khurmala Dome Field in northern Iraq to Avrasya Technology Engineering and Construction Inc. of Turkey, Dynamic Processing Solutions Ltd. of the United Kingdom, and the Kar Construction and Engineering Group of Iraq. The contract was the first oilfield development contract issued by the new Government.

In 2004, Iraqi crude oil production capacity was about 2.5 million barrels per day (Mbbl/d). Actual crude oil output, which ranged from less than 1.8 Mbbl/d to about 2.4 Mbbl/d, was limited by export capacity, which was impacted by the frequent acts of sabotage on the country's pipeline network. The value of lost production attributed to insurgent attacks on Iraqi oil facilities from March 2003 to December 2004 was estimated by the Ministry of Oil to be about $8 billion. In 2004, crude oil exports averaged about 1.43 Mbbl/d via the offshore terminals near Basra in the south—Khor Al-Amaya, which reopened in February, and Mina al-Bakr—and about 120,000 bbl/d via the northern pipeline to Ceyhan, Turkey. The northern pipeline was a frequent target of sabotage and was closed for repairs for much of the year (Middle East Economic Digest, 2005; Hafidh, 2004§; Khaleej Times Online, 2005§).

Iraq's crude oil refineries operated at about 100,000 bbl/d less than nameplate capacity, which was more than 650,000 bbl/d, because of variable crude oil supply, electrical power shortages, sabotage, years of spare parts shortages under United Nations' sanctions that had resulted in jury-rigged operations, and unrepaired war damage. Despite processing about 200 million barrels in 2004, refined petroleum product demand exceeded the domestic supply, which forced the Government to import refined products. The significantly increased domestic demand for petroleum products resulted in the Government's proposal for

[1]References that include a section mark (§) are found in the Internet References Cited section.

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the construction of two new oil refineries with a total capacity of more than 600,000 bbl/d (Slevin, 2003; Middle East Economic Digest, 2005).

References Cited

International Monetary Fund, 2005, Iraq, Statistical Appendix: Washington, DC, International Monetary Fund Country Report No. 05/295, August, 17 p.

Middle East Economic Digest, 2004, Khor al-Zubair fertilizer plant starts up again: Middle East Economic Digest, v. 48, no. 14, p. 9.

Middle East Economic Digest, 2005, Waiting for the driver to recover: Middle East Economic Digest, v. 49, no. 13, April 1, p. 28-29.

Slevin, Peter, 2003, Coaxing an aging oil refinery back to life: Washington Post, The, April 29, p. A11.

U.S. Energy Information Administration, 2005a, Table 3.3a—Petroleum imports from Bahrain, Iran, Iraq, and Kuwait: Washington, DC, U.S. Energy Information Administration, Monthly Energy Review, July, p. 48.

U.S. Energy Information Administration, 2005b, Table 3.3h—Petroleum imports from Trinidad and Tobago, United Kingdom, U.S. Virgin Islands, other non-OPEC, total non-OPEC, and total imports: Washington, DC, U.S. Energy Information Administration, Monthly Energy Review, July, p. 55.

Internet References Cited

Gulf News, 2004 (October 14), Iraq drawing up plans to attract foreign firms, accessed October 19, 2004, via http://www.zawya.com.

Hafidh, Hassam, 2004 (December 30), Iraq 2004 oil exports average 1.5M b/d, accessed January 1, 2005, at URL http://www.slb.com/news/story.cfm?storyid=624461.

Khaleej Times Online, 2005 (January 3), Insurgent attacks on oil industry cost Iraq $8b, accessed January 4, 2005, at URL http://www.khaleejtimes.com/DisplayArticle.asp?xfile=data/business/2005/January/business_January31.xml&section=business.

Kuwait Ministry of Oil, 2004 (May 5), Al Oun—Kuwait to receive Iraqi gas in October 2005, accessed October 6, 2004, at URL http://www.moo.gov.kw/news.asp?NID=280.

U.S. Central Intelligence Agency, 2005, Iraq, World Factbook 2005, accessed August 23, 2005, at URL http://www.odci.gov/cia/publications/factbook/geos/iz.htm.

TABLE 1
IRAQ: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
METALS						
Steel, crude		50	50	--	--	--
INDUSTRIAL MINERALS						
Cement, hydraulic:						
Portland		6,000	6,000	6,834 [4]	1,901 [r, 4]	2,500
White		175	158 [r]	175	54 [r, 4]	15
Nitrogen, N content of ammonia		200	280	532 [4]	-- [4]	30
Phosphate rock, beneficiated, phosphorus pentoxide content		200	100	100	10	30
Salt		300	300	203 [4]	50 [4]	50
Sulfur, elemental:						
Native, Frasch		300	300	300	50	--
Byproduct[5]		50 [r]	50 [r]	50 [r]	1	20
Total		350 [r]	350 [r]	350 [r]	51	20
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	7,500	7,000	7,000	4,000	7,000
Dry	do.	3,000	2,920	2,900	1,500	2,900
Natural gas plant liquids	thousand 42-gallon barrels	4,000	4,000	4,000	2,000	2,000
Petroleum:						
Crude, including lease condensate	do.	937,000	860,000	740,000	490,000	737,940 [4]
Refinery products	do.	140,000	170,000	170,000	50,000	50,000

[r]Revised. -- Zero.

[1]Estimated data are rounded to no more than three significant digits.

[2]Includes data available through August 2005.

[3]In addition to commodities listed, the following also may have been produced but information is inadequate to estimate output: secondary aluminum, clay, fertilizers, gypsum, secondary lead, lime, limestone, industrial (glass or silica) sand, sand and gravel, and stone.

[4]Reported figure.

[5]From petroleum and natural gas processing.

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TABLE 2
IRAQ: STRUCTURE OF THE CEMENT INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Major operating companies, major equity owners, and plants	Process type and location of main facilities	2004 operating capacity	Annual design capacity
Iraqi Cement Co. (Government, 100%)			
Al Tamim Cement Plant	2 dry process lines at Kirkuk	150,000	2,000,000
Kubaisa Cement Plant	2 dry process lines at Kubaisa	150,000	2,000,000
Al Qaim Cement Plant	1 dry process line at Al Qaim	90,000	1,000,000
Fallujah White Cement Plant	3 dry process lines at Fallujah	50,000	300,000
Fallujah Cement Plant	2 wet process lines at Fallujah	--	200,000
Northern Cement Co. (Government, 100%)			
Sinjar Cement Plant	2 dry process lines at Mosul	290,000	1,200,000
Badoosh III Cement Plant	1 dry process line at Mosul	250,000	1,000,000
Badoosh II Cement Plant	2 wet process lines at Mosul	130,000	700,000
Hammam Al Alil II Cement Plant	1 wet process line at Mosul	15,000	450,000
Hammam Al Alil I Cement Plant	2 wet process lines at Mosul	--	200,000
Badoosh I Cement Plant	do.	--	190,000
Southern Cement Co. (Government, 100%)			
Karbala Cement Plant	2 dry process lines at Karbala	90,000	2,000,000
Muthena Cement Plant	2 dry process lines, 37 kilometers from Muthena	220,000	2,000,000
Al Najaf Al Ashref Cement Plant	4 wet process lines at Kufa	420,000	1,800,000
Um Qasr	1 dry process line at Um Qasr	60,000	500,000
Al Jinoob Cement Plant	1 wet process line at Samawa	25,000	450,000
Samawa Cement Plant	do.	--	400,000
Kufa I Cement Plant	1 wet process line at Kufa	145,000	200,000
Al Sadaa Cement Plant	2 wet process lines near Sadat Al Hindia	72,000	150,000
Tasluja Cement Plant (Kurdistan Regional Government)	2 dry process lines near Suleimaniyah	300,000	2,300,000
United Cement Co. (Kurdistan Regional Government)	2 wet process lines at Sarchinar	100,000	250,000
Total		2,557,000	19,290,000

-- Negligible or no production.

Sources: The European Cement Association, company reports, press articles, and U.S. Department of Commerce.

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The Mineral Industry of Israel

By Thomas R. Yager

Israel was the world's second leading producer of bromine, the fifth leading producer of potash, and the eighth leading producer of phosphate rock in 2004. The country also produced such industrial minerals as flint clay, gypsum, kaolin, magnesia, silica sand, and sulfur and such metals and metal products as lead, magnesium, and steel. Building materials produced in Israel included cement, crushed stone, marble, and sand. Israel also cut imported diamond and other gemstones and produced natural gas, petroleum, and petroleum products (Jasinski, 2005; Lyday, 2005; Searls, 2005).

In 2004, Israel's gross domestic product (GDP) at purchasing power parity amounted to $145 billion. The GDP increased by 4.3% in 2004 compared with 1.3% in 2003. Production in the mining and quarrying sector fell by 3% in 2003, and in the nonmetallic mineral products sector, by 5.2% (Israel Central Bureau of Statistics, 2004, p. 20.13, 20.15; International Monetary Fund, 2005, p. 202; 2005§[1]).

The subsidiaries of Israel Chemicals Ltd. (ICL) produced bromine, fertilizers, magnesia, magnesium metal, phosphate rock, potash, and salt. In 2004, Dead Sea Bromine Group (DSBG) produced 202,000 metric tons (t) of bromine compared with 176,000 t in 2003. The company consumed 80% of its bromine in the manufacture of bromine compounds. DSBG planned to increase its capacity to 280,000 metric tons per year (t/yr) in 2006 from 240,000 t/yr in 2004 (Israel Chemicals Ltd., 2005, p. 38, 45; Sharbel Shehadeh, Ministry of National Infrastructures, written commun., October 17, 2005).

Mining of phosphate rock by Rotem Amfert Negev Ltd. declined for the fifth consecutive year in 2004. Dead Sea Works (DSW) increased its potash production to 2.06 million metric tons (Mt) in 2004 from 1.75 Mt in 2000. DSW also produced salt; national salt production was an estimated 398,000 t in 2004 compared with 376,000 t in 2003. Dead Sea Periclase Ltd. produced high-purity caustic calcined magnesia; the company's output of dead-burned magnesia fell because of competition from China. In 2004, Dead Sea Magnesium Ltd. produced 28,000 t of magnesium metal compared with 26,000 t in 2003 (O'Driscoll, 2004; Sharbel Shehadeh, Ministry of National Infrastructures, written commun., October 17, 2005).

Negev Industrial Minerals Ltd. (NIM) produced flint clay, gypsum, lime, limestone, quartz, and silica sand. In 2004, ICL sold NIM to Doraz D.R. for $21.2 million. In 2004, national production of gypsum rose to 75,930 t from 64,845 t; lime production fell to 690,659 t from 702,373 t; and silica sand production fell to 196,330 t from 210,815 t (Industrial Minerals, 2004; Sharbel Shehadeh, Ministry of National Infrastructures, written commun., October 17, 2005).

Nesher Israel Cement Enterprises Ltd. was Israel's only cement producer. In 2004, the company produced 4.49 Mt of cement compared with 4.63 Mt in 2003 and 4.58 Mt in 2002. Israel also produced an estimated 41 Mt of crushed stone and 6 Mt of sand (Sharbel Shehadeh, Ministry of National Infrastructures, written commun., October 17, 2005).

In 2004, production of natural gas rose to 1.19 billion cubic meters from 8 million cubic meters in 2003 because of the opening of the Mari-B gasfield in the Mediterranean Sea. In 2005, Noble Energy Inc. and its partners planned to start supplying Israel Electric Corporation Ltd. with 1.76 billion cubic meters of natural gas per year from Mari-B for 10 years. The companies also planned to sell 114 million cubic meters per year to the petroleum refinery in Ashdod. Noble also announced plans to increase the capacity of onshore receiving facilities to 6.2 billion cubic meters per year to match that of the Mari-B offshore facilities because of expected increases in natural gas demand in 2006 and 2007 (Noble Energy Inc., 2005, p. 9).

Outlook

The outlook for Israel's bromine, lead, magnesium, phosphate, potash, and salt industries depends heavily upon world market conditions for these commodities; the cement, crushed stone, gypsum, lime, marble, and natural gas industries, however, depend mainly upon the strength of the Israeli economy. The International Monetary Fund (2005, p. 202) predicted that Israel's GDP would grow by 3.7% in 2005 and 3.6% in 2006.

References Cited

Industrial Minerals, 2004, ICL sells Negev Industrial Minerals: Industrial Minerals, no. 442, July, p. 12.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Israel Central Bureau of Statistics, 2004, Statistical abstract of Israel 2004: Jerusalem, Israel, Israel Central Bureau of Statistics, 899 p.

Israel Chemicals Ltd., 2005, Description of corporate activity for period ending December 31, 2004: Tel-Aviv, Israel, Israel Chemicals Ltd., 97 p.

Jasinski, S.M., 2005, Phosphate rock: U.S. Geological Survey Mineral Commodity Summaries 2005, p. 122-123.

Lyday, P.A., 2005, Bromine: U.S. Geological Survey Mineral Commodity Summaries 2005, p. 38-39.

Noble Energy Inc., 2005, 2004 annual report: Houston, Texas, Noble Energy Inc., 117 p.

O'Driscoll, Mike, 2004, Magnesia in a squeeze: Industrial Minerals, no. 443, August, p. 35-43.

Searls, J.P., 2005, Potash: U.S. Geological Survey Mineral Commodity Summaries 2005, p. 126-127.

Internet Reference Cited

International Monetary Fund, 2005 (April), Israel, World Economic Outlook Database, accessed July 15, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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TABLE 1
ISRAEL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
METALS						
Iron and steel, steel, crude[e]		270,000	220,000	150,000	150,000	280,000
Lead, refined secondary		13,000	20,000	22,000	25,000	27,000
Magnesium metal		31,700	34,000	26,000 r	26,000 r	28,000
INDUSTRIAL MINERALS						
Bromine, elemental		210,000	200,000 r,e	185,000 r	176,000 r	202,000
Caustic soda[e]		44,000 r	47,000 r	54,000 r	57,000 r	64,000
Cement, hydraulic	thousand metric tons	5,703	4,700	4,584 r	4,632 r	4,494
Clays:						
Brick clay		35,000	36,000 r,e	35,672 r	36,256 r	65,732
Fuller's clay		NA	NA	998,193	892,658	850,000
Kaolin		13,000	--	--	--	--
Diamond[4]	thousand carats	1,672	1,367	1,188	771	770 e
Gypsum		130,000	70,000 r,e	14,175 r	64,845 r	75,930
Lime		350,000	550,000 r,e	751,857 r	702,373 r	690,659
Magnesia, Mg content[e]		57,000	55,000	50,000	45,000	40,000
Phosphate:						
Phosphate rock, mine output:						
Beneficiated	thousand metric tons	4,110	3,511	3,468	3,208	2,947
P_2O_5 content	do.	1,305	1,115	1,100	1,020	940
Phosphatic fertilizers, P_2O_5 equivalent:						
Monoammonium phosphate		11,000	13,000	13,000	12,000	12,000
Triple superphosphate		115,000	94,000	108,000	202,000	170,000
Phosphoric acid, P_2O_5 equivalent		520,000	561,000	567,000	580,000	543,000
Potash, K_2O equivalent	thousand metric tons	1,750	1,770	1,920	1,960	2,060
Salt, marketed (mainly marine)[e]	do.	526 [3]	460 r	392 r	376 r	398
Sand:						
Silica sand		300,000	250,000 r,e	209,347 r	210,815 r	196,330
Other[e]	thousand metric tons	10,500 [3]	8,000 r	6,000 r	6,000 r	6,000
Stone:						
Crushed[e]	do.	29,000 [3]	40,000 r	49,000 r	44,000 r	41,000
Dimension, marble		128,000 r	120,000 r,e	106,302 r	68,605 r	30,936
Sulfur:						
Byproduct from petroleum	thousand metric tons	38	35	36	45	42 p
Sulfuric acid:						
Gross weight	do.	1,875	1,900	1,956	1,894	1,789 p
S content	do.	613	621	639	619	581 p
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural, dry	million cubic meters	10 r	10 r,e	9 r	8 r	1,193
Petroleum:						
Oil shales		390,000	415,000	457,900	436,500	439,200
Crude	42-gallon barrels	31,300	29,800	34,300	22,400	14,000
Refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	5,414	6,045	5,591	5,500	6,170
Gasoline	do.	14,676	16,911	18,863	19,034	21,046
Naptha	do.	7,915	7,089	3,798	4,376	3,722
Kerosene	do.	9,428	8,195	7,886	8,639	8,555
Distillate fuel oil	do.	21,649	23,424	21,169	22,208	20,516
Residual fuel oil	do.	26,039	23,787	22,432	22,910	11,880
Other	do.	1,855 r	1,959 r	2,007 r	2,151 r	1,835
Total	do.	86,976 r	87,410 r	81,746 r	84,818 r	73,724

[e]Estimated; estimated data are rounded to no more than three significant digits. [p]Preliminary. [r]Revised. -- Zero. NA Not available.

[1]Table includes data available through October 18, 2005.

[2]In addition to the commodities listed, imported gemstones are cut; and potassium nitrate, secondary refined zinc, such fertilizers as monopotassium phosphate, and a variety of crude construction materials are produced, but available information is inadequate to make estimates of output.

[3]Reported figure.

[4]Imported diamond cut in Israel.

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TABLE 2
ISRAEL: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Bromine		Dead Sea Bromine Group (DSBG) (Israel Chemicals Ltd. (ICL), 100%)	Sdom	240.
Cement		Nesher Israel Cement Enterprises Ltd.	Ramla	5,000 clinker; 3,600 cement.
Do.		do.	Haifa	2,000 clinker; 450 cement.
Do.		do.	Har Tuv	1,000 clinker; 700 cement.
Flint clay and quartz		Negev Industrial Minerals Ltd. (NIM) (Doraz D.R.)	Mactesh Ramon	25.
Lead, refined secondary		Harkunas Lead Works	Ashdod	25.
Lime		Negev Industrial Minerals Ltd. (NIM)	Mishor Rotem	90.
Magnesium:				
Magnesia		Dead Sea Periclase Ltd. (DSP) [Israel Chemicals Ltd. (ICL), 100%]	do.	95.
Do.		Tateho Dead Sea Fused Magnesia Co. [Dead Sea Periclase Ltd. (DSP), 50%, and Tateho Chemical Industries Co. of Japan, 50%	do.	13.
Magnesium, refined		Dead Sea Magnesium Ltd. [Israel Chemicals Ltd. (ICL), 65%, and Volkswagen AG of Germany, 35%]	Sdom	34.
Natural gas	million cubic meters	Samedan, Mediterranean Sea, Inc. (Noble Energy Inc., 100%)	Mari-B gasfield	6,200.
Petroleum:				
Crude	thousand 42-gallon barrels	Lapidoth Israel Oil Prospectors Corp.	Heletz-Brur	22.
Do.	do.	do.	Kochav	9.
Refined	do.	Oil Refineries Ltd. (Government, 100%)	Haifa	58,400.
Do.	do.	do.	Ashdod	36,500.
Phosphate:				
Phosphate rock		Rotem Amfert Negev Ltd. [Israel Chemicals Ltd. (ICL), 100%]	Arad, Oron, and Zin	4,500.
Phosphatic fertilizers		do.	Rotem	1,700.
Do.		Haifa Chemicals Ltd.	Haifa	NA.
Phosphoric acid[1]		Rotem Amfert Negev Ltd.	Rotem	640.
Do.		Haifa Chemicals Ltd.	Haifa	NA.
Potassium:				
Potash		Dead Sea Works (DSW) [Israel Chemicals Ltd. (ICL), 100%]	Sdom	2,800.
Potassium nitrate		Haifa Chemicals Ltd.	Haifa	300.
Do.		do.	Mishor Rotem	200.
Salt		Dead Sea Works (DSW)		700.
Do.		Israel Salt Industries Ltd. (subsidiary of Danker Group)	Atlit, Eilat, and Kalia	NA.
Sand		Negev Industrial Minerals Ltd. (NIM)	Mactesh Htira	300.
Steel:				
Crude		Hod Metals	Akko	200.
Do.		Yehuda Steel Ltd.	Ashdod	150.
Rebar		do.	Gedera	230.
Do.		do.	Ashdod	120.
Do.		do.	Akko	220.
Do.		Hod Metals	Kiryat Gat	100.
Sulfur		Oil Refineries Ltd.	Ashdod	40.
Do.		do.	Haifa	33.
Sulfuric acid		Rotem Amfert Negev Ltd.	Rotem	NA.
Zinc		Numinor Chemical Industries Ltd.	Maalot	NA.

NA Not available.
[1] P_2O_5 equivalent.

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THE MINERAL INDUSTRY OF JORDAN

By Thomas R. Yager

Jordan was the world's fifth leading world producer of phosphate rock and the sixth leading producer of potash. It also produced such industrial minerals as bromine, feldspar, gypsum, kaolin, salt, and silica sand and such building materials as cement, dimension stone, limestone, and marble. Natural gas and petroleum products have been produced for domestic consumption. Deposits of copper, gold, iron, sulfur, and titanium were found in Jordan (Jasinski, 2005; Searls, 2005).

In 2004, Jordan's gross domestic product (GDP) amounted to about $24.7 billion at purchasing power parity. Per capita GDP at purchasing power parity was about $4,400. Jordan's GDP grew by 6.7% in 2004 compared with a revised 3.3% in 2003. In 2004, the output of the manufacturing sector amounted to 20% of the GDP; construction, 5.5%; electricity and water, 3%; and mining and quarrying, 3% (Central Bank of Jordan, 2005, p. 83; International Monetary Fund, 2005, p. 210; 2005§[1]).

In 2004, total exports were valued at $3.26 billion, of which potash accounted for $231 million; fertilizers, $175 million; phosphate rock, $166 million; phosphoric acid, $90.5 million; and cement, $30 million. Minerals and associated processed products accounted for 21% of total exports. Total imports were valued at $8.19 billion, of which crude petroleum accounted for $1.08 billion; iron and steel, $356 million; and refined petroleum products, $292 million (Central Bank of Jordan, 2005, p. 64-67).

Jordan Bromine Company [a joint venture of Arab Potash Company Ltd. (APC) and Albemarle Corp. of the United States] produced bromine, calcium bromide, and sodium bromide at its plant at al-Safi on the Dead Sea. In 2004, bromine production amounted to 46,000 metric tons (t). In December, the company completed construction of its chlorine plant at al-Safi; this facility had a capacity of 25,000 metric tons per year (t/yr) (Albemarle Corp., 2005, p. 16).

In January 2004, Jordan Magnesia Company (a subsidiary of APC) started producing magnesia at al-Safi. The company's plant had capacities of 50,000 t/yr of refractory-grade magnesia and 10,000 t/yr of magnesium hydroxide and other magnesium compunds. By June, the plant was producing at 65% of capacity; production for the year was 22,000 t (Allaf, 2004; O'Driscoll, 2005).

The Jordan Phosphate Mines Company (JPMC) produced phosphate rock at the al-Abiad, the al-Hasa, and the Shidiya Mines. Phosphate rock production fell to 6.22 million metric tons (Mt) in 2004 from 6.76 Mt in 2003. JPMC planned to produce 8.5 Mt in 2010. In 2003, the discovery of 17 Mt of additional reserves increased the life of the al-Abiad and the al-Hasa Mines from 2007 to at least 2017 (Jordan Times, 2003).

Indo-Jordan Chemicals Company and Jordan Fertilizer Industry Company (JFIC) produced phosphoric acid. JFIC and Nippon Jordan Fertilizer Company (NJFC) also produced fertilizers at Aqaba.

APC's potash production fell to 1.93 Mt in 2004 from 1.96 Mt in 2003. In December 2004, APC announced plans to expand capacity to 2.45 million metric tons per year (Mt/yr) from about 1.9 Mt/yr. The expansion was expected to be completed in late 2007 or 2008. APC was also evaluating a future expansion to 3 Mt/yr (Arab Potash Company Ltd., 2004).

Kemira Arab Potash Company (a joint venture of APC and Kemira AG) started commercial production of potassium nitrate fertilizer and dicalcium phosphate animal feed supplement in 2003. Production was below capacity because of technical problems (Allaf, 2004).

Middle East Regional Development Enterprises planned to start commercial production of fracturing sand, silica flour, and silica sand at its processing plant in the first quarter of 2005. The plant, which was located at Ras al-Naqab, had a capacity of 530,000 t/yr; total resources at the adjacent mine were estimated to be 400 Mt (Industrial Minerals, 2005).

Production of natural gas increased at the Risha gasfield by about 2% in 2004. Reserves amounted to 6 billion cubic meters. Jordan imported natural gas from Egypt through the Arab Gasline at a rate of about 1 billion cubic meters per year. Imports were expected to rise to 2 billion cubic meters per year by 2008 (Clark, 2004).

Outlook

Jordan's economy was expected to grow by 5% in 2005 and 5.5% in 2006 (International Monetary Fund, 2005, p. 210). The strength of the domestic economy could lead to higher demand for cement, dimension stone, sand and gravel, and steel. The outlook for bromine, magnesia, phosphate rock, and potash depended heavily upon world market conditions.

References Cited

Albemarle Corp., 2005, Form 10-K for the fiscal year ended December 31, 2004: Richmond, Virginia, Albemarle Corp., 97 p.

Allaf, Heba, 2004, Arab Potash Company: Amman, Jordan, Jordan Export Finance Bank, 11 p.

Arab Potash Company Ltd., 2004, APC to increase production and employee benefits: Amman, Jordan, Arab Potash Company Ltd. press release, December 16, 1 p.

Central Bank of Jordan, 2005, Monthly statistical bulletin: Central Bank of Jordan, v. 41, no. 6, June, 102 p.

Clark, Martin, 2004, Mashreq gas grid emerging: Petroleum Economist, v. 72, no. 2, February, p. 19.

Industrial Minerals, 2005, Jordanian silica start up: Industrial Minerals, no. 448, January, p. 59.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Jasinski, S.M., 2005, Phosphate rock: U.S. Geological Survey Mineral Commodity Summaries 2005, p. 122-123.

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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Jordan Times, 2003, JPMC adds 17 million tonnes to confirmed phosphate reserve: Jordan Times [Amman, Jordan], March 18, 1 p.
O'Driscoll, Mike, 2005, Magnesia on the high road again: Industrial Minerals, April, no. 451, p. 37-45.
Searls, J.P., 2005, Potash: U.S. Geological Survey Mineral Commodity Summaries 2005, p. 126-127.

Internet Reference Cited

International Monetary Fund, 2005 (April), Jordan, World Economic Outlook Database, accessed August 22, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

TABLE 1
JORDAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
Bromine		--	--	-- r	-- r	46,000 p
Cement, hydraulic	thousand metric tons	2,640	3,173	3,558	3,515	3,908
Clay:						
Common clay		199,468	300,000 r,e	400,000 r,e	492,583 r	608,390
Kaolin		36,795	24,124 r	100,000 r,e	179,153 r	216,566
Zeolite tuff		9,797	7,500 r,e	5,000 r,e	2,710 r	2,790
Feldspar		11,112	611	530	13,057 r	13,060
Gypsum		157,868	86,012	11,252	63,895 r	135,331
Lime[e]		4,100	6,000 r	8,000 r	10,108 r,2	7,154 2
Magnesia		--	--	--	--	22,000 p
Natural gas, dry	million cubic meters	289 r	278 r	255 r	288 r	294
Petroleum:						
Crude	42-gallon barrels	13,200 r	11,800 r	11,000 r	9,839 r	8,480
Refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	1,684	1,606	1,577	1,485 r	1,600 e
Gasoline	do.	4,957	5,465	5,383	5,084 r	5,400 e
Jet fuel	do.	1,950	1,693	1,650	2,109 r	2,200 e
Kerosene	do.	1,991	1,398	1,608	1,484 r	1,600 e
Distillate fuel oil	do.	6,662	7,456	8,139	8,579 r	9,100 e
Residual fuel oil	do.	8,929	8,564	7,911	7,759 r	8,300 e
Asphalt	do.	688	821	1,066	1,200 r	1,300 e
Total	do.	26,861	27,003	27,334	27,700 r	29,500 e
Phosphate:						
Phosphate rock, mine output:						
Gross weight	thousand metric tons	5,526	5,843	7,179	6,762 r	6,223
P_2O_5 content	do.	1,824	1,928	2,340	2,230	2,050
P_2O_5 equivalent:						
Diammonium phosphate		197,000	256,000	267,000	210,000	293,000
Phosphoric acid		543,000	482,000	594,000	563,000	566,000
Potash:						
Crude salts	thousand metric tons	1,936	1,963	1,956	1,961	1,929
K_2O equivalent	do.	1,162	1,180	1,170	1,230	1,210
Salt		311,189	329,000	406,652 r	11,976 r	28,700 p
Sand:						
Silica		118,045	90,000 r,e	60,000 r,e	33,100 r	46,000
Other	thousand metric tons	NA	NA	NA	8,349	17,320 p
Steel:						
Crude[e]		30,000	30,000	134,000 r,2	135,000 r	135,000
Semimanufactured[e]		270,000 2	290,000	290,000	290,000	290,000
Stone:						
Dimension, worked	thousand meters	3,508	7,000 r,e	10,000 r,e	13,578 r	6,560 p
Gravel and crushed rock	thousand cubic meters	10,381	11,000 e	13,000 r,e	14,266 r	14,900 p
Limestone[e]	do.	8,000	8,400	9,600	9,500	9,500
Marble	cubic meters	21,575	21,000 r,e	21,000 r,e	20,685 r	27,650 p
Sulfuric acid:						
Gross weight	thousand metric tons	1,760 r	1,650 r	1,800 r	1,650 r	1,790
S content	do.	575 r	539 r	588 r	539	585

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. -- Zero.
[1]Table includes data available through September 12, 2005.
[2]Reported figure.

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TABLE 2
JORDAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Country and commodity		Major operating companies	Location of main facilities	Annual capacity
Bromine		Jordan Bromine Company (Arab Potash Company Ltd., 50%, and Kemira Danmark A/S, 50%)	al-Safi	50.
Cement		Jordan Cement Factories Co. Ltd. (LaFarge Group, 44%; Jordan Investment Corp., 14.3%; Social Security Corp., 9%)	Fuhia and Rashadia	4,100.
Do.		Arab Company for White Cement Industry	Amman	130.
Magnesia		Jordan Magnesia Company (Arab Potash Company Ltd., 55.8%)	al-Safi	60.
Natural gas	million cubic meters	National Petroleum Company (Government, 100%)	Risha	460.
Petroleum:				
Crude	thousand 42-gallon barrels	National Petroleum Company	Hamza	NA.
Refined	do.	Jordan Petroleum Refinery Company	Zarqa	33,000.
Phosphate:				
Phosphate rock		Jordan Phosphate Mines Company (Jordan Investment Corp., 41.5%; Social Security Corp., 27.8%; Kuwait Investment Corp., 15.9%)	al-Hasa	4,000.
Do.		do.	Shidiya	3,264.
Do.		do.	al-Abiad	3,000.
Phosphatic fertilizers		Jordan Fertilizer Industry Company (Government, 26%, and Jordan Phosphate Mines Company, 25%)	Aqaba	600 DAP.[1]
Do.		Nippon Jordan Fertilizer Company (Arab Potash Company Ltd., 20% and Jordan Phosphate Mines Company, 20%,)	Shiyada	100 DAP; 200 other.
Do.		Kemira Arab Potash Company (Arab Potash Company Ltd., 50%, and Kemira Danmark A/S, 50%)	Aqaba	75.
Phosphoric acid[2]		Jordan Fertilizer Industry Company	do.	750.
Do.[2]		Indo-Jordan Chemicals Company (Southern Petrochemical Industries Corp., 52.2%; Jordan Phosphate Mines Company 34.8%; Arab Investment Co., 13%)	Shiyada	224.
Potash		Arab Potash Company Ltd. (Government of Jordan, 52.9%; Arab Mining Co., 20.7%; Islamic Development Bank, 5.2%)	al-Safi	1,900.
Potassium nitrate		Kemira Arab Potash Company	Aqaba	150.
Salt		Jordan Safi Salt Company (subsidiary of Arab Potash Company Ltd.)	al-Safi	1,232.
Do.		al-Azraq	Azraq	NA.
Sand, silica		Middle Eastern Regional Development Enterprises	Ras al-Naqab	530.
Steel:				
Crude		Jordan Steel plc	Amman	250.
Semimanufactured		do.	do.	250.
Do.		National Steel Industry Co.	Awajan	100.
Do.		Other steel producers	NA	506.
Sulfuric acid		Jordan Fertilizer Industry Company	Aqaba	1,640.
Do.		Indo-Jordan Chemicals Company	Shiyada	660.

NA Not available.
[1]Diammonium phosphate.
[2]Expressed in phosphorus pentoxide (P_2O_5) equivalent.

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The Mineral Industry of Kuwait

By Philip M. Mobbs

Kuwait's economy revolved around the production and refining of hydrocarbons, which contributed more than 50% of Kuwait's gross domestic product (GDP) at current prices, accounted for about 91% of Government revenue, and employed about 3% of the nation's population. The GDP at constant prices increased by 7.2% in 2004 compared with 9.7% in 2003. Based on purchasing power parity valuation, the GDP in 2004 was estimated to be $36.13 billion. Of the world's leading crude oil producers, Kuwait ranked 12th. Among the natural gas producers, it ranked 37th (KPC World, 2004a; BP p.l.c., 2005, p. 6, 22; Central Bank of Kuwait, 2005§[1]; International Monetary Fund, 2005§).

Trade

A majority of exports and imports were transported by sea. In 2004, total exports (free on board) were valued at $28.8 billion,[2] of which oil exports accounted for about $26.7 billion and manufactured fertilizer exports accounted for $120 million. In 2003, the revised value of total exports was $20.7 billion, of which oil exports accounted for about $19 billion and manufactured fertilizer exports accounted for $106 million. Total imports (cost, insurance, and freight paid to point of destination) in 2004 were estimated to be $12 billion compared with $11 billion in 2003 (Central Bank of Kuwait, 2005§).

Commodity Review

Industrial Minerals

Salt.—Ahli Industrial Projects Co. completed a plant to purify imported salt. Output would supplement production of its marine salt facility at Shuaiba. Produced salt was used primarily to produce chlorine, sodium hydroxide, and sodium hypochlorite.

Sulfur.—Kuwait National Petroleum Co. K.S.C. (KNPC) installed two new sulfur extraction units at the Mina Abdulla crude oil refinery.

Mineral Fuels

Coke.—In 2004, negotiations continued regarding the construction of a 350,000-metric-ton-per-year (t/yr)-capacity calcined coke plant. Petroleum Coke Industries Corp. planned to have the $130-million to $150-million plant in operation by 2007. KNPC, which operated a 600,000-t/yr-capacity petroleum coke plant at its Mina Abdulla refinery, was to provide the green petroleum coke feedstock to the calcine plant (KPC World, 2004b; Kuwait National Petroleum Co. K.S.C., undated§).

Natural Gas.—Domestic Kuwaiti natural gas production was insufficient to meet the demand of the industrial and power sectors, and output volumes varied because Kuwaiti gas production was associated with crude oil production that was subject to OPEC production quotas. In 2004, the Ministry of Energy continued negotiations to import natural gas, and a contract to import about 991,000 cubic meters per day from Iraq by October 2005 was signed. The initial import of more than 8 million cubic meters per day of natural gas from Iran, which originally was scheduled to begin in 2005, was rescheduled to begin in 2007. Negotiations continued for an offshore natural gas pipeline that would transport 8 billion to 15 billion cubic meters per year of natural gas from Qatar. Because of the insufficient supply of gas, the Kuwait Government delayed its planned program (originally scheduled to start in 2005) to substitute imported natural gas for the fuel oil that fired the country's powerplants (Petroleum Economist, 2003; Iran Daily, 2005; Ministry of Oil, 2004§).

Oil.—Parliament continued to discuss Project Kuwait, which was a proposed $7 billion project to expand production by foreign oil companies at five oilfields in northern Kuwait to about 900,000 barrels per day (bbl/d) from 450,000 bbl/d. Because the Kuwaiti constitution prohibited foreign ownership of Kuwaiti mineral resources, the proposed Project Kuwait development was to be performed by international oil companies under service contracts that would allow ownership of the oil resources to remain under Government control. Kuwait Oil Co., which was a subsidiary of Kuwait Petroleum Corp., also proposed a new strategic program to produce an additional 900,000 bbl/d of heavy crude oil by 2020 and to increase natural gas exploration activity in Kuwait (Oster, 2003§; Platts, 2004§; Fardan, 2005§).

KNPC, which was a subsidiary of Kuwait Petroleum Corp., continued preparations for a new refinery at Shuaiba. The 450,000 bbl/d refinery was expected to cost $1 billion. In addition to the new sulfur extraction units at the Mina Abdulla refinery, KNPC planned additional work on the company's older refineries to facilitate the production of low- and ultra-low-sulfur fuels from Kuwaiti crude oil, which was in the medium- to high-sulfur range. Because of the mandated reduction of the sulfur content of automotive fuels in Japan in 2004 and the similar reduction scheduled to take place in Korea by 2006, Asian importers of Kuwaiti crude oil were being forced to upgrade their domestic petroleum refineries to produce low-sulfur fuels (KPC World, 2005; Middle East Economic Digest, 2005; Platts, 2005§).

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[1]References that include a section mark (§) are found in the Internet References Cited section.

[2]Where necessary, values have been converted from Kuwaiti dinars (KD) to U.S. dollars (US$) at the rate of KD0.294=US$1.00 for 2004 and KD0.298=US$1.00 for 2003.

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References Cited

BP p.l.c., 2005, Statistical review of world energy 2005: London, United Kingdom, BP p.l.c., June, 41 p.

Iran Daily, 2005, Gas deal with Oman: Iran Daily, March 16, p. 3.

KPC World, 2004a, Large future projects for KD 11.6 billion KPC—On the threshold of a new era: KPC World, no. 29, July-September, p. 14-17.

KPC World, 2004b, Talal Al Khalid highlights the new promising era of progress: KPC World, no. 29, July-September, p. 10-13.

KPC World, 2005, Key challenges facing Kuwait's oil industry: KPC World, no. 31, January-March, p. 38-41.

Middle East Economic Digest, 2005, Selected Middle East oil & gas projects: Middle East Economic Digest, v. 49, no. 2, January 14, p. 49-51.

Petroleum Economist, 2003, News in brief—Kuwait: Petroleum Economist, v. 70, no. 3, March, p. 45.

Internet References Cited

Central Bank of Kuwait, 2005, Quarterly statistical bulletin—January-March 2005, accessed June 10, 2005, via URL http://www.cbk.gov.kw/WWW/index.html.

Fardan, Abdulla, 2005 (January 12), Kuwait government submits new oil contract data to Parliament, accessed January 12, 2005, at URL http://www.slb.com/news.story.cfm?storyid=624800.

International Monetary Fund, 2005 (April), Kuwait, World Economic Outlook Database, accessed May 3, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

Kuwait National Petroleum Co. K.S.C., [undated], KNPC refineries, Mina Abdullah, accessed May 25, 2005, at URL http://www.knpc.com.kw/about/Refineries.htm.

Ministry of Oil, 2004 (May 5), Al Oun—Kuwait to receive Iraqi gas in October 2005, accessed October 6, 2004, at URL http://www.moo.gov.kw/news.asp?NID=280.

Oster, Shai, 2003 (November 4), Kuwait oil co hopes to tender oil project by end '04, accessed August 26, 2005, at URL http://www.prophet.net/quotes/stocknews.jsp?symbol=BP&article=20031104460_1e6b00105372350f.

Platts, 2004 (November 8), Asia seen as biggest future buyer of Kuwaiti oil—Report, accessed November 9, 2004, via URL http://www.platts.com.

Platts, 2005 (June 17), S Korean refiners focused on secondary unit upgrades—Hyundai CEO, accessed June 17, 2005, via URL http://www.platts.com.

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TABLE 1
KUWAIT: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002[e]	2003[e]	2004[e]
Cement		1,187,000	920,700	1,584,000	1,600,000	1,600,000
Lime, hydrated and quicklime[e]		40,000	40,000	40,000	40,000	40,000
Natural gas:[e, 3]						
Gross	million cubic meters	11,000	10,900	9,900	10,000	11,000
Dry	do.	9,600	9,500	8,700	8,800	9,600
Natural gas liquids[e]	thousand 42-gallon barrels	41,100	44,300	40,000	40,000	45,000
Nitrogen:						
N content of ammonia		409,500	400,000	414,400 [4]	444,400 [4]	413,400 [4]
N content of urea		287,600	290,000	320,000	330,000	320,000
Petroleum:						
Crude[3]	thousand 42-gallon barrels	766,000	745,000	680,000	817,000	880,000
Refinery products:[e]						
Liquefied petroleum gases	do.	2,997 [4]	3,000	3,000	3,000	3,000
Gasoline, motor	do.	11,757 [4]	10,000	15,000	15,000	15,000
Kerosene	do.	45,049 [4]	30,000	45,000 [r]	45,000 [r]	45,000
Distillate fuel oil	do.	83,981 [4]	70,000	85,000 [r]	85,000 [r]	85,000
Residual fuel oil	do.	57,116 [4]	60,000	75,000 [r]	75,000 [r]	75,000
Other	do.	71,769 [4]	70,000	80,000	86,000 [r]	86,000
Total	do.	269,672 [4]	240,000	300,000 [r]	306,000 [r]	306,000
Salt[e]		100,000	100,000	100,000	100,000	100,000
Sulfur:[e]						
Elemental, petroleum byproduct		512,000	524,000	634,000	714,000	730,000
Sulfuric acid		100,000	150,000	150,000	150,000	150,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised.

[1]Table includes data available through June 20, 2005.

[2]In addition to commodities listed, caustic soda, chlorine, clays, clay products, petroleum coke, and sand and gravel were produced, but available information is inadequate to make estimates of output.

[3]Includes Kuwait's share of production from the Partitioned Neutral Zone.

[4]Reported figure.

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The Mineral Industry of Lebanon

By Thomas R. Yager

The Lebanese mineral industry continued to make its historically small contribution to the country's economy. In recent years, Lebanon has been known to produce cement, gypsum, lime, phosphatic fertilizers, phosphoric acid, salt, steel, and sulfuric acid for domestic consumption. Modest deposits of asphalt, coal, and iron ore occur in Lebanon. In 2004, Lebanon's gross domestic product (GDP) amounted to about $22.1 billion at purchasing power parity. The per capita GDP at purchasing power parity was about $5,900. The GDP grew by 5% in 2004 compared with an increase of 3% in 2003 (International Monetary Fund, 2005, p. 210; 2005§[1]).

Consolidated Steel Lebanon SAL, which was Lebanon's only rolling mill, shut down in 2002 because of high input costs. The country depended upon imports to meet its demand for steel. The International Iron and Steel Institute (2004, p. 82) estimated that consumption of finished steel products amounted to 461,000 metric tons (t) in 2003 compared with 443,000 t in 2002 and 909,000 t in 1998. In 2004, rebar prices rose by about 35% because of the Middle Eastern construction boom (Banque du Liban, 2004, p. 19; Irish, 2005).

Lebanon's cement factories were owned by Ciment de Sibline SAL, Cimenterie Nationale SAL, Holcim (Liban) SAL, and Seament SAL. Domestic cement sales amounted to 2.7 million metric tons (Mt) in 2003. Holcim (Liban) had a market share of 43%; Cimenterie Nationale, 32%; Ciment de Sibline, 19%; and Seament, 6%. Imports of asbestos, cement, plaster, and stone amounted to $135 million, or 2% of total imports. In 2004, cement prices rose by 20% because of the Middle Eastern construction boom (Banque du Liban, 2004, p. 19; Irish, 2005; Investment Development Authority of Lebanon, undated§).

Lebanon had about 1,200 quarries, of which only 75 had permits to operate. In July 2003, the Government decided to shut down all Lebanon's quarries and import sand and gravel from Syria because of the environmental damage caused by the quarries. Forest cover declined from 20% of the country's land area in 1975 to less than 7% in 2004 because of civil war, firewood consumption, quarry operations, and urban expansion. Sand and gravel prices increased sharply because of the closures; many quarries continued to operate illegally in 2004 (Raad, 2004; Saab, 2004).

Lebanon imported phosphate rock from Syria to produce phosphoric acid and such fertilizers as triple superphosphate. Lebanon Chemicals Company SAL produced sulfuric acid for use in fertilizer manufacturing; imports were sourced from Russia and Saudi Arabia. Production fell by 3% in 2003 (table 1).

Lebanon has no petroleum reserves; the country relies on imports for its energy requirements. In 2003, imports of petroleum products amounted to 4.73 Mt, which was a decrease of 1.8% from that of 2002. Lebanon was expected to start importing natural gas from Syria by May 2005 as part of the Arab Gasline project. In the first year of the project, the Deir Ammar power station would produce electricity from natural gas; imports of natural gas were expected to be about 550 million cubic meters per year. Electricité du Liban (EdL) was expected to save $100 million per year as a result of using natural gas instead of fuel oil. By mid-2006, the Zahrani power station was expected to start production of electricity. Imports of natural gas would rise to nearly 1.1 billion cubic meters per year and were expected to result in costs savings for EdL of $200 million per year. In a subsequent phase of the project, imports could rise to 2.2 billion cubic meters per year. The conversion of all Lebanese powerplants from natural gas to fuel oil would save $300 million per year (Iran Daily, 2003; Arab Petroleum Research Center, 2004; Banque du Liban, 2004, p. 6; Daily Star, 2005).

In 2003, Lebanon's production of electricity amounted to 10,547 gigawatthours, which was an increase of 3.5% from that of 2002. EdL estimated that the rising demand for electricity and the decommissioning of the 331-megawatt (MW) Jieh and 65-MW Al Haricha powerplants would necessitate the installation of 750 MW of new capacity by 2005 (Arab Petroleum Research Center, 2004; Banque du Liban, 2004, p. 6).

Lebanon's transportation network comprised about 7,300 kilometers (km) of roads, of which 6,200 km was paved. Railroad track totaled 401 km, most of which was damaged during the civil war. The country had 209 km of crude oil pipelines.

[1]References that include a section mark (§) are found in the Internet References Cited section.

References Cited

Arab Petroleum Research Center, 2004, Lebanon, *in* Arab Oil & Gas Directory 2004: Paris, France, Arab Petroleum Research Center, p. 239-248.

Banque du Liban, 2004, Quarterly bulletin—Fourth quarter 2003: Banque du Liban, no. 99, 62 p.

Daily Star, 2005, Lebanon-Syria gas pipeline completed: Daily Star [Beirut, Lebanon], April 1, 1 p.

International Iron and Steel Institute, 2004, Steel Statistical Yearbook 2004: Brussels, Belgium, International Iron and Steel Institute, 111 p.

International Monetary Fund, 2005, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Iran Daily, 2003, Syria-Iran gas pipeline could unlock massive benefits: Iran Daily [Tehran, Iran], November 4, p. 8.

Irish, John, 2005, Cement surges forward: Middle East Economic Digest, v. 49, no. 6, February 11-17, p. 30, 32.

Raad, Nada, 2004, Environmentalists welcome decision to stop illegal quarries: Daily Star [Beirut, Lebanon], July 22, 1 p.

Saab, Najib, 2004, Good government is needed to protect environment: Daily Star [Beirut, Lebanon], July 1, 4 p.

Digitized by Google

Internet References Cited

International Monetary Fund, 2005 (April), Lebanon, World Economic Outlook Database, accessed May 2, 2005, via http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

Investment Development Authority of Lebanon, [undated], Why Lebanon—Facts and figures, accessed April 26, 2005, at URL http://www.idal.com.lb/WhyLebanon.aspx?ID=61.

TABLE 1
LEBANON: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
Cement, hydraulic	thousand metric tons	2,808	2,890	2,852	2,900 e	2,900 e
Gypsum[e]		1,700	1,600	1,700	1,700	1,700
Iron and steel, metal, semimanufactures		80,000	80,000 e	40,000 e	--	--
Lime[e]		14,000	14,000	14,000	14,000	14,000
P_2O_5 equivalent:						
Phosphatic fertilizers		15,000	20,000	30,000	53,000 r	85,000
Phosphoric acid		122,000	135,000	150,000	166,000 r	175,000
Salt[e]		3,500	3,500	3,500	3,500	3,500
Sulfuric acid:						
Gross weight		400,000	400,000	480,000	485,000 r	495,000
S content		131,000	131,000	157,000	159,000 r	162,000

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.
[1]Table includes data available through August 15, 2005.
[2]In addition to the commodities listed, sand and gravel and other construction materials were also produced, but quantities are not reported, and information is inadequate to make estimates of output.

TABLE 2
LEBANON: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Holcim (Liban) SAL (Holcim Ltd., 55.8%)	Chekka	1,800
Do.	Cimenterie Nationale SAL	do.	1,650
Do.	Ciment de Sibline SAL	Sibline	1,200
Do.	Seament SAL	Chekka	500
Phosphate fertilizers	Lebanon Chemicals Company SAL	Selaata	NA
Phosphoric acid	do.	do.	NA
Steel	Consolidated Steel Lebanon SAL[1]	Amchit	300
Sulfuric acid	Lebanon Chemicals Company SAL	Selaata	NA

NA Not available.
[1]Shut down in 2002.

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The Mineral Industry of Oman

By Philip M. Mobbs

Natural gas and crude oil dominated Oman's economy. In 2004, Oman's total crude oil production declined by almost 5% compared with an 8.5% drop in 2003 and a 6.8% decline in 2002. The Government's potential loss of revenue from the production decline was again offset by the average price received for Omani oil, which increased to $34.42 per barrel in 2004 compared with $27.84 per barrel in 2003 and $24.29 per barrel in 2002. Total Government revenues were $10.4 billion[1] in 2004. Government revenue from hydrocarbons increased to almost $8.2 billion, of which crude oil accounted for $6.9 billion, and natural gas, $1.2 billion. In 2003, total hydrocarbon revenue income amounted to about $6.3 billion compared with $5.9 billion in 2002 (Ministry of National Economy, 2005c§,[2] d§).

In 2004, the Omani gross domestic product (GDP) based on purchasing power parity was estimated to be $37.2 billion and the GDP per capita based on purchasing power parity was reported to be $15,648 (International Monetary Fund, 2005§).

In addition to hydrocarbon extraction, the liquefaction of natural gas, and petroleum refining in Oman, chromite, gold, gypsum, salt, sand and gravel, silver, and stone were mined or quarried; cement was manufactured; imported copper ore was smelted and refined; and sulfur was recovered as a coproduct of petroleum processing.

Trade

In 2004, total merchandise exports were valued at $13.3 billion, of which reexports accounted for $1.4 billion. Crude oil exports accounted for 68% of merchandise exports; liquefied natural gas, 12%; base metals and articles, 1%; mineral products, 1%; and petroleum products, 1%. Of the 263.6 million barrels of crude oil that was exported from Oman in 2004, China received 40.3%; Thailand, 16.4%; Republic of Korea, 15.9%; Japan, 15.5%; and Taiwan, 4.6%. The value of imported mineral products was $453 million and accounted for 5.3% of total recorded merchandise imports in 2004 (Ministry of National Economy, 2005a§, b§).

Commodity Review

Metals

Aluminum.—In 2004, Alcan Inc. of Canada agreed to join the Sohar aluminum smelter venture of Abu Dhabi Water and Electricity Authority and Oman Oil Co. S.A.O.C. The group proposed to start construction of a 326,000-metric-ton-per-year (t/yr)-capacity aluminum smelter in 2005 and to begin commercial operations by 2008 (Middle East Economic Digest, 2004b).

Copper.—National Mining Co., which was a subsidiary of the MB Group of Oman, expected to begin mining the Shinas-Hatta copper prospect in 2005.

Industrial Minerals

Cement.—The regional construction boom and related increased demand for cement resulted in proposals to more-than double existing production capacity in Oman. Oman Cement Co. S.A.O.G. planned to expand its Muscat works with a 1.5 million-metric-ton-per-year (Mt/yr)-clinker-grinding-capacity expansion. The proposed plant expansion was scheduled to begin production in 2007. Raysut Cement Co. awarded contracts for the construction of a 1.1-Mt/yr-capacity cement plant at Salalah (World Cement, 2004a, b).

Nitrogen.—Construction continued on Oman India Fertilizer Co. S.A.O.C.'s 3,500-metric-ton-per-day (t/d)-capacity ammonia and 5,060-t/d-capacity granular urea facility at Sur. Initial production was expected in 2005. Sohar International Urea and Chemical Industries S.A.O.C. awarded a construction contract for a $500 million 2,000-t/d ammonia and 3,500-t/d granular urea plant at Sohar. Commercial operations were expected to begin in 2008 (Middle East Economic Digest, 2004a; Oman Oil Co., S.A.O.C., undated§).

Mineral Fuels and Related Materials

Natural Gas.—Construction continued on the $690 million 3.7-Mt/yr-capacity natural gas liquefaction plant (train) for Qalhat LNG Co. S.A.O.C. (QLNG). Commercial operations at the QLNG liquefied natural gas train, which was located adjacent to the two-train 6.6-Mt/yr-capacity facility of Oman Liquefied Natural Gas LLC at Qalhat, were expected to begin in 2006 (Petroleum Economist, 2005).

Petroleum and Sulfur.—In February 2004, Oman Oil Refinery LLC commissioned a 20,000-barrel-per-day (bbl/d)-capacity diesel hydro-desulfurization unit and a 15-t/d sulfur recovery unit at its 85,000 bbl/d crude oil refinery at Mina Al Fahal. Sulfur content of the refinery's diesel fuel output was reduced to 50 parts per million (ppm) from about 6,000 ppm (Oman Oil Refinery LLC, 2004§).

In 2004, construction began on the 116,400-bbl/d crude oil refinery for Sohar Refinery Co., which was a subsidiary of the Government (80% equity interest held for the Government by the Ministry of Finance) and Oman Oil (20%). Commerical operations at the Sohar refinery were expected to begin in 2006 (SPG Media PLC, 2005§).

[1]Where necessary, values have been converted from rials Omani (RO) to U.S. dollars (US$) at the average exchange rate of RO0.386=US$1.00 for 2004, RO0.384=US$1.00 for 2003, and RO0.386=US$1.00 for 2002.

[2]References that include a section mark (§) are found in the Internet References Cited section.

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References Cited

Middle East Economic Digest, 2004a, New EPC contractor for SIUCI Sohar fertiliser: Middle East Economic Digest, v. 48, no. 39, September 24, p. 14.

Middle East Economic Digest, 2004b, Sohar smelter goes to bid: Middle East Economic Digest, v. 48, no. 50, December 10, p. 22.

Petroleum Economist, 2005, Oman: Petroleum Economist, v. 72, no. 5, May, p. 45.

World Cement, 2004a, New order for KHD Humboldt Wedag AG: World Cement, v. 35, no. 6, June, p. 10.

World Cement, 2004b, On the up in Oman: World Cement, v. 35, no. 11, November, p. 57-58.

Internet References Cited

International Monetary Fund, 2005 (April), Oman, World Economic Outlook Database, accessed May 3, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

Ministry of National Economy, 2005a, Monthly bulletin—Crude oil and gas sector, accessed August 24, 2005, at URL http://www.moneoman.gov.om/publications/monthly_bulletin/T6.htm.

Ministry of National Economy, 2005b, Monthly bulletin—Foreign trade, accessed August 24, 2005, at URL http://www.moneoman.gov.om/publications/monthly_bulletin/T4.htm.

Ministry of National Economy, 2005c, Monthly bulletin—Major economic & social indicators, accessed August 24, 2005, at URL http://www.moneoman.gov.om/publications/monthly_bulletin/T1.htm.

Ministry of National Economy, 2005d, Monthly bulletin—Public finance, accessed August 24, 2005, at URL http://www.moneoman.gov.om/publications/monthly_bulletin/T3.htm.

Oman Oil Co., S.A.O.C., [undated], Projects under construction—Domestic projects, accessed October 26, 2004, at URL http:///www.oman-oil.com/projectsunderconst.asp.

Oman Oil Refinery LLC, 2004, Green diesel in Oman, accessed August 25, 2005, at URL http://www.orc.co.om/news_archives.shtml.

SPG Media PLC, 2005 (July 26) Sohar refinery, Wilayat of Sohar, Oman, accessed August 25, 2005, at URL http://www.hydrocarbons-technology.com/projects/sohar.

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TABLE 1
OMAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003[e]	2004[e]
Cement, hydraulic		1,238,063	1,369,570	1,700,000 [r,e]	2,100,000 [r]	2,500,000
Chromium, gross weight		15,110	30,150	27,444	13,000 [r]	18,575 [3]
Copper, metal:						
Smelter		23,790	24,220	24,000 [e]	17,000	24,000
Refinery		24,281	24,000 [e]	24,000 [e]	17,000	24,000
Gas, natural:						
Gross	million cubic meters	15,496	19,268	22,366	24,128 [r,3]	24,150 [3]
Dry	do.	12,020	14,000	14,800 [e]	17,000 [r,e]	17,000
Gold	kilograms	551	603	188 [e]	4 [3]	--
Gypsum		131,909	44,323	55,722	50,000	60,000
Iron and steel, crude steel[e]		--	10,000	60,000	80,000	90,000
Natural gas liquids[e]	thousand 42-gallon barrels	6,000	6,000	6,000	6,000	6,000
Petroleum:						
Crude and condensate[e]	do.	353,000	352,000	328,000	300,000	285,385 [3]
Refinery products:						
Liquefied petroleum gas[e]	do.	350	366 [3]	545	550	473 [3]
Gasoline	do.	4,857	4,198	5,428	5,400	5,215 [3]
Jet fuel and kerosene	do.	1,643	1,489	2,008	2,000	1,407 [3]
Distillate fuel oil	do.	6,363	5,338	6,658	6,700	6,442 [3]
Residual fuel oil	do.	14,797	11,980	14,942	15,000	14,247 [3]
Other	do.	638	666	1,048	1,000	1,162 [3]
Total	do.	28,648	24,037	30,629	30,700	28,946 [3]
Salt		11,700	13,983	14,410	15,000	15,000
Sand and gravel		22,448,254	25,967,815	21,736,414	22,000,000	22,000,000
Silver	kilograms	4,894	3,153	38	--	--
Stone:						
Marble		147,686	157,249	135,930	140,000	140,000
Other		3,537,216	3,395,589	3,182,522	3,200,000	3,500,000
Sulfur[e]		30,000	30,000	30,000	30,000	30,000

[e]Estimated; estimated data are rounded to no more than three significant digits and may not add to totals shown. [r] Revised. -- Zero.

[1]Table includes data available through August 2005.

[2]In addition to the commodities listed, clay for bricks and tile was produced and steel scrap melted, but available information is inadequate to make estimates of output levels.

[3]Reported figure.

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The Mineral Industry of Qatar

By Philip M. Mobbs

The State of Qatar is located north of Saudi Arabia on a peninsula in the Persian Gulf. In 2004, the 11,437 square kilometer country supported a population of 743,000. Qatar's mineral output, which was dominated by hydrocarbons, also included the production of clay, dolomite and limestone, gypsum, sand, and shale. The processed mineral sector encompassed the production of ammonia, cement, direct-reduced iron, lime, methanol, crude steel, sulfur, and urea.

According to the International Monetary Fund (2005§[1]), the Qatari gross domestic product (GDP) at purchasing power parity was estimated to be about $21.9 billion[2] in 2004 and the per capita GDP at purchasing power parity was estimated to be more than $28,900. The GDP at constant prices increased by 9.9% compared with an 8.5% increase in 2003. In 2004, the natural gas and oil sector accounted for about 62% of the GDP (Qatar Central Bank, 2005, p. 6).

Commodity Review

Metals

Aluminum.—In 2004, United Development Co. of Qatar's joint venture with Ferrostaal AG of Germany and JGC Corp. of Japan sought a partner to replace Dubai Smelter Developments FZE, which had withdrawn from the partnership in 2003. United Development had proposed to build a 516,000- to 620,000-metric-ton-per-year (t/yr)-capacity aluminum smelter at Ras Laffan at a cost of $2.1 billion to $2.6 billion. In December, Norsk Hydro ASA of Norway and Qatar Petroleum proposed to develop a 570,000-t/yr-capacity aluminum smelter at Mesaieed with initial production projected to begin in 2009. The proposed Mesaieed project would include an aluminum casthouse, an aluminum plant, an anode plant, and a dedicated powerplant fueled by domestic natural gas. The facility site was large enough to allow for construction of a second potline in the future (Metal Bulletin, 2003; Middle East Economic Digest, 2004b; Peninsula, The, 2004§).

Industrial Minerals

Cement.—Qatar National Cement Co. awarded the contract to build a 1-million-metric-ton-per-year (Mt/yr)-capacity cement plant to FCB Ciment of France. The new plant would be built adjacent to Qatar National's two existing cement plants at Umm Bab and would raise the company's total capacity to 2.4 Mt/yr by late 2006. Much of the new capacity would be for domestic consumption (Middle East Economic Digest, 2004a).

Gypsum.—Qatari Saudi Gypsum Industries Co., in which Qatar Industrial Manufacturing Co. held a 33.3% equity interest, was expanding the capacity of its gypsum plant to 120,000 t/yr (Dr. Hazim Al-Jadi, Director, Projects Department, Qatar Industrial Manufacturing Co., written commun., October 21, 2004).

Magnesium.—In 2004, Magnesium International Ltd. of Australia proposed to build an 88,000-t/yr-capacity magnesium smelter. The company evaluated Qatar as a potential site because of the availability of low-cost electrical energy and natural gas in the country but decided to build the smelter in Egypt (Magnesium International Ltd., 2004).

Nitrogen.—In April, Qatar Fertilizer Co. S.A.Q. commissioned the $534-million Qafco 4 ammonia and urea production facility at Mesaieed, which boosted the company's total production capacity to 2.8 Mt/yr of urea and 2 Mt/yr of ammonia. Production from the Qafco 4 plant quickly exceeded its 3,200-metric-ton-per-day (t/d)-urea and 2,000-t/d-ammonia design capacity (Qatar Fertilizer Co. S.A.Q., 2005, p. 9).

Sand.—Qatar Sand Treatment Plant (a subsidiary of Qatar Industrial Manufacturing Co.) expanded its capacity to 3 Mt/yr. Output was used in the construction industry (Dr. Hazim Al-Jadi, Director, Projects Department, Qatar Industrial Manufacturing Co., written commun., October 21, 2004).

Mineral Fuels

Natural Gas and Petroleum.—Several gas-utilization programs that would significantly increase national natural gas production were under evaluation or underway. These included the construction of gas-to-liquids plants, additional liquefied natural gas trains, and international gas pipelines. Unlike many other countries with natural gas reserves, very little of Qatar's gas was associated with oilfield production. Qatar's unassociated natural gas was not impacted by the Organization of the Petroleum Exporting Countries (OPEC) crude oil production quotas.

In March, the Ras Laffan Liquefied Natural Gas Co. Ltd. (II) officially opened the $1.3 billion 4.7-Mt/yr liquefied natural gas Train 3. Also in 2004, Total S.A. initiated a 20,000-barrel-per-day (bbl/d)-capacity expansion project on the Al Kahalik oilfield. The company expected production from the field to reach 50,000 bbl/d by early 2005 (Total S.A., 2004).

Reserves

Estimated to be about 25.8 trillion cubic meters, Qatar's proven natural gas reserves were the third largest in the world after Russia (47 trillion cubic meters) and Iran (26.7 trillion

[1]References that include a section mark (§) are found in the Internet References Cited section.

[2]Where necessary, values have been converted from Qatari rials (QR) to U.S. dollars (US$) at the average exchange rate of QR3.643=US$1.00 for 2004 and QR3.637=US$1.00 for 2003.

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cubic meters). In 2004, crude oil reserves were estimated to be 15.2 billion barrels (BP p.l.c., 2005, p. 4, 20; U.S. Energy Information Administration, 2005§).

Outlook

As long as natural gas is a highly desired fuel and petrochemical feedstock, the economy of Qatar is expected to prosper. With proven reserves of nearly 26 trillion cubic meters, Qatar could provide natural gas to the international market for more than 500 years. The abundance of natural gas in Qatar is expected to continue to attract energy-intensive industries, such as aluminum and additional petrochemical facilities.

References Cited

BP p.l.c., 2005, Statistical review of world energy: London, United Kingdom, BP p.l.c., June, 41 p.

Magnesium International Ltd., 2004, Magnesium smelter moves to the Middle East to achieve world's lowest production cost: Sydney, Australia, Magnesium International Ltd., October 11, 2 p.

Metal Bulletin, 2003, Dubal signs up for Qatar smelter: Metal Bulletin, no. 8777, May 29, p. 9.

Middle East Economic Digest, 2004a, FCB, GL Smidth bid for QNCC expansion contract: Middle East Economic Digest, v. 48, no. 5, January 30, p. 19.

Middle East Economic Digest, 2004b, Hydro signs for QP smelter: Middle East Economic Digest, v. 48, no. 50, December 10, p. 22.

Qatar Central Bank, 2005, Quarterly statistical bulletin—March: Doha, Qatar, Qatar Central Bank, 59 p.

Qatar Fertilizer Co. S.A.Q., 2005, 2004 annual report: Mesaieed, Qatar, Qatar Fertilizer Co. S.A.Q., 20 p.

Total S.A., 2004, Production start-up of third phase of development on Al Khalij field in Qatar: Courbevoie, France, Total S.A., September 9, 1 p.

Internet References Cited

International Monetary Fund, 2005 (September), Qatar, World Economic Outlook Database, accessed May 3, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

Peninsula, The, 2004 (January 24), Qatar firm, Dubal call off aluminium smelter project contract, accessed October 25, 2004, at URL http://www.thepeninsulaqatar.com/Display_news.asp?section=business_news&month=january2004&file=business_news2004012424127.xml.

U.S. Energy Information Administration, 2005 (February), Qatar, Country Analysis Brief, accessed July 25, 2005, at URL http://www.eia.doe.gov/emeu/qatar.html.

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TABLE 1
QATAR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002[e]	2003[e]	2004[e]
Cement, hydraulic[e]		1,210,000 [r]	1,240,000	1,340,000	1,400,000	1,400,000
Gas, natural:						
Gross	million cubic meters	33,656	37,132	39,000	40,000	50,000
Dry	do.	26,141	27,738	29,300	31,400 [r]	39,200
Iron and steel:						
Direct-reduced iron		620,962	733,549	750,000	780,000	830,000
Steel, crude		743,615	907,608	1,027,000 [3]	1,054,000 [3]	1,046,000 [3]
Semimanufactures:						
Billet		728,780	891,117	300,000 [r]	300,000 [r]	300,000
Bars		579,525	713,500	715,000	700,000	800,000
Natural gas liquids	thousand 42-gallon barrels	24,126	26,726	27,000	28,000	28,000
Nitrogen:						
N content of ammonia		1,097,000	1,159,118	1,166,100 [3]	1,185,300 [3]	1,428,000 [3]
N content of urea		770,761	779,388	798,700 [3]	800,000	1,000,000
Petroleum:						
Crude	thousand 42-gallon barrels	231,000	237,000	230,000	274,000	287,000
Refinery products:						
Gasoline	do.	4,521	4,948	4,020	14,900	15,000
Kerosene	do.	2,997	3,911	2,450	7,370	7,400
Distillate fuel oil	do.	4,490	3,824	4,340	7,370	7,400
Residual fuel oil	do.	6,264	4,492	2,850	2,880	2,900
Other	do.	736	514	2,100	9,560	9,600
Total	do.	19,008	17,689	15,800	42,100	42,300
Stone, limestone[e]		900,000	900,000	900,000	950,000 [r]	1,000,000
Sulfur		190,868	220,824	221,000	221,000	250,000

[e]Estimated; estimated data are rounded to no more than three significant digits and may not add to totals shown. [r]Revised.

[1]Table includes data available through July 2005.

[2]In addition to the commodities listed, clays, dolomite, gypsum, limestone, sand and gravel, shale for construction purposes, and methanol are produced in Qatar, but available information is inadequate to make estimates of output.

[3]Reported figure.

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TABLE 2
QATAR: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Al-Jabor Cement Industries Co.	Clinker grinding mill at Mesaieed	165
Do.		Qatar National Cement Co. (Government, 43%)	Kilns and mills at Umm Bab	1,400
Iron and steel:				
Iron, direct reduction		Qatar Steel Co. Ltd. (Industries Qatar Co., 100%)	Mesaieed	730
Steel, crude		do.	Plant at Mesaieed	1,200
Steel, rolled		do.	Rolling mill at Mesaieed	740
Lime		Qatar National Cement Co. (Government, 43%)	Kilns at Umm Bab	28
Methanol		Qatar Fuel Additives Co. Ltd. (Industries Qatar Co., 50%; Chinese Petroleum Corp., 20%; Lee Chang Yung Chemical Industry Corp., 15%; International Octane Ltd., 15%)	Mesaieed	825
Natural gas:				
Extracted	billion cubic meters	Qatar Liquefied Gas Co. Ltd. (Qatar Petroleum, 65%; Total S.A., 20%; ExxonMobil Qatargas Inc., 10%; Mitsui & Co., Ltd., 2.5%; Marubeni Corp., 2.5%)	North Field, offshore	20
Do.	do.	Ras Laffan Liquefied Natural Gas Co. Ltd. (Qatar Petroleum, 63%; ExxonMobil Rasgas, Inc., 25%; Korea Gas Corp., 5%; Itochu Corp., 4%; LNG Japan Corp., 3%)	do.	11
Do.	do.	Qatar Petroleum	do.	1
Liquefied		Qatar Liquefied Gas Co. Ltd. (Qatar Petroleum, 65%; Total S.A., 10%; ExxonMobil Qatargas Inc., 10%; Mitsui & Co., Ltd., 7.5%; Marubeni Corp., 7.5%)	Three trains at Ras Laffan	9,400
Do.		Ras Laffan Liquefied Natural Gas Co. Ltd. (Qatar Petroleum, 63%; ExxonMobil Rasgas, Inc., 25%; Korea Gas Corp., 5%; Itochu Corp., 4%; LNG Japan Corp., 3%)	Two trains at Ras Laffan	6,600
Do.		Ras Laffan Liquefied Natural Gas Co. Ltd. (II) (Qatar Petroleum, 70%; ExxonMobil Rasgas, Inc., 30%)	One train at Ras Laffan	4,780
Nitrogen:				
Ammonia		Qatar Fertilizer Co. S.A.Q. (Qatar Petroleum, 75%; Yara Nederland BV, 15%; Fertilizer Holdings AS, 10%)	QAFCO 1, Mesaieed	416
Do.		do.	QAFCO 2, Mesaieed	420
Do.		do.	QAFCO 3, Mesaieed	548
Do.		do.	QAFCO 4, Mesaieed	730
Urea		do.	QAFCO 1, Mesaieed	447
Do.		do.	QAFCO 2, Mesaieed	511
Do.		do.	QAFCO 3, Mesaieed	730
Do.		do.	QAFCO 4, Mesaieed	1,200
Petroleum:				
Crude	thousand 42 -gallon barrels	Qatar Petroleum	Dukhan Field, onshore	120,000
Do.	do.	Maersk Oil Qatar A.S. (Maersk Olie og Gas A.S.)	Al Shaheen Field, offshore	73,000
Do.	do.	Total S.A.	Al Khaleej, offshore	29,000
Do.	do.	Qatar Petroleum	Bu Hanine Field, offshore	25,000
Do.	do.	do.	Maydan Mahzam, Field, offshore	18,000
Do.	do.	Occidental Petroleum of Qatar Ltd.	Idd Al Sharqi, North Dome and South Dome	17,000
Do.	do.	Anadarko Petroleum Corp., 92.5%, and Preussag Energie GmbH, 7.5%	Al Rayyan, offshore	8,500
Do.	do.	Bunduq Co., Ltd. (BP Exploration, 33.3%; Total S.A., 33.3%; United Petroleum Development Co., 33.3%)	El Bunduq[1]	7,210
Refined	do.	Qatar Petroleum	Mesaieed	50,000
Sulfur		Ras Laffan LNG Co.	Ras Laffan	110
Do.		Qatar Petroleum	Mesaieed	95
Do.		Qatar Petrochemical Co. Ltd.	Umm Said	70
Do.		Qatar Liquefied Gas Co. Ltd.	Ras Laffan	66

[1]El Bunduq Field is located on the border between Qatar and the United Arab Emirates. Royalties are shared by the Governments.

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The Mineral Industry of Saudi Arabia

By Philip M. Mobbs

In 2004, the Kingdom of Saudi Arabia maintained its position as the leading oil producer in the world. In addition to crude oil, natural gas, and products of processed petroleum and natural gas, such as carbon black, methanol, petrochemicals, refined petroleum products, and sulfur, other mineral and mineral-based commodity production included barite, cement, construction and industrial materials, copper, nitrogenous and phosphatic fertilizers, ferroalloys, gold, granite, lead, salt, silica sand, silver, and zinc. Steel was produced from scrap and imported iron ore pellets. Titanium dioxide pigment was produced from imported rutile (U.S. Energy Information Administration, 2005a).

Historically, construction projects in the Kingdom were advanced in times of high oil prices and deferred in times of lower oil prices, but with projected sustained demand for oil from China coupled with the effects of supply disruptions, such as the delay in the resumption of significant oil exports from Iraq, oilfield infrastructure damaged by hurricanes in the Gulf of Mexico, strikes in Nigeria, and terrorist attacks in Saudi Arabia, many companies operated under the expectation that high oil prices would continue for a few more years. In 2004, the third consecutive year of increased oil prices resulted in the continuation of a construction boom in Saudi Arabia. Additional proposals were floated for mineral-based commodity projects, especially in the construction-related area, such as cement and steel, and in petrochemicals. In addition to the expenditures of Government-owned companies, which dominated the minerals sector, domestic and international (under the Foreign Investment Act of 2000) investors provided funds for some exploration and production-capacity expansions in the nonfuel minerals sector and in natural gas exploration in the Rub al-Khali (Lidstone, 2004; Tan, 2004).

The International Monetary Fund (2005§[1]) estimated that the gross domestic product (GDP) based on purchasing power parity was $316 billion[2] in 2004 and that the GDP per capita based on purchasing power parity was about $13,955. The real GDP growth rate was estimated to have increased by 5.2%.

Government Policies and Programs

In 2004, the Government initiated the proposed privatization of state-owned Saudi Arabian Mining Co. (Ma'aden). Ma'aden's gold mining section was expected to be divested by an initial public offering of shares in 2006.

The Saudi Cabinet approved a new mining investment law in 2004. The new law would eliminate the profit-sharing requirements of the old law and reduce the tax on mining income to 20%. The maximum size of mineral exploration licenses would be reduced to 100 square kilometers (km^2) from 10,000 km^2. Licenses offered under the new law included 2-year reconnaissance and material collection licenses, 5-year exploration licenses, 5-year building-materials quarry licenses, 20-year small mine licenses, and 30-year mine and raw materials quarry licenses.

Trade

In 2004, exports of crude oil and petroleum products from Saudi Arabia to the United States were reported to be about 1.558 million barrels per day (Mbbl/d). Of this total, about 1.495 Mbbl/d was crude oil, which accounted for about 14.8% of the United States' crude oil imports and made Saudi Arabia the United States' third ranked source of imported crude oil in 2004 after Canada and Mexico. The United States had imported an average of 1.774 Mbbl/d of crude oil and petroleum products from Saudi Arabia in 2003. Exports of crude oil to China have tripled in the past 5 years to about 47,000 barrels per day (bbl/d) in 2004 compared with about 15,000 bbl/d in 2000 (U.S. Energy Information Administration, 2005b).

Commodity Review

Metals

Bauxite and Alumina.—In 2004, work on the feasibility study of the Az Zabirah project was underway for Ma'aden. The Government awarded contracts to design a 1,400-kilometer (km) railroad that would link the Al Jalamid phosphate deposit and the proposed 3.4-million-metric-ton-per-year (Mt/yr)-capacity Az Zabirah bauxite mine to the rail line that passes through Riyadh. The 450-km rail line from Riyadh to Damman would be renovated, and a spur line would be installed to Ras al-Zhor where Ma'aden proposed building a 1.4-Mt/yr alumina plant (Smith, 2004§).

Iron and Steel.—The construction boom resulted in the increased domestic demand for steel in Saudi Arabia. Saudi Iron and Steel Co. (Hadeed) contracted out several projects for its facility at Al-Jubail. Projects included a 1.2-Mt/yr expansion of the electric arc furnace (EAF) plant by a consortium of Siemens AG and Voest Alpine Industrieanlangenbau GmbH. & Co. (VAI); the expansion of the hot-rolling mill to 2 Mt/yr from 800,000 metric tons per year (t/yr) that the consortium of SMS Demag AG and VAI expected to complete in early 2006; the construction of a 500,000-t/yr bar and wire rod mill that Danieli Morgårdshammar Co. and Dwyidag Saudi Arabia Co., Ltd. expected to complete in early 2006; and the expansion of the direct-reduction iron facility to 1.76 Mt/yr by the consortium of Midrex Technologies, Inc. and VAI (Middle East Economic Digest, 2004f; Midrex Technologies, Inc., 2004; Siemens AG, 2004).

Al-Azizia Steel Co. Ltd. proposed building a 450,000-t/yr-capacity meltshop at Hadda. Al-Yamamah Co. for Reinforcing

[1]References that include a section mark (§) are found in the Internet References Cited section.

[2]Where necessary, values have been converted from Saudi riyals (SRls) to U.S. dollars at the rate of SRls3.75=US$1.00.

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Steel Bars Ltd. awarded a contract to Danieli Morgårdshammar for a 500,000 t/yr rolling mill that was expected to be operational in 2005. The mill would be designed to produce 8- to 36-millimeter deformed bars. Rajhi Steel Industries awarded the contract to Danieli Centro Met S.p.A. for the construction of a $253 million 850,000-t/yr steel plant at Jeddah. The plant's 100-metric-ton EAF was expected to start up in late 2005 (Danieli Group, 2004; Metal Bulletin, 2004; Danieli Group, 2004§).

Construction of a 300,000-t/yr-capacity factory for Arabian Pipes Co. was expected to be completed in mid-2005. The plant was designed to manufacture pipes in the 40.7- to 122-centimeter size range (MESteel.com, 2004§).

Industrial Minerals

Cement.—The construction boom in Saudi Arabia and the adjacent Gulf region resulted in the significantly increased demand for cement in Saudi Arabia. Domestic companies responded with a number of proposed capacity expansions or new cement lines. Work continued on the 4,500-metric-ton-per-day (t/d) clinker line no. 3, which was located 330 km northwest of Riyadh, for Qassim Cement Co. Commercial production was scheduled to begin in late 2005 (World Cement, 2004).

Arab Cement Co. received bids on the installation of a new 7,000-t/d-capacity cement line at its Rabigh facility. Southern Province Cement Co. awarded the construction contract for a 5,000-t/d-capacity cement clinker plant to Sinoma International Engineering Co., Ltd. of China. Tabuk Cement Co. proposed increasing its cement mill capacity to 260 t/d from 180 t/d (Middle East Economic Digest, 2004b, h, i).

Yamama Saudi Cement Co. Ltd. awarded contracts to Polysius AG and Gama Industry Arabia Ltd. for a 10,000-t/yr-capacity cement line. The new line will be built at Yamama's six-line 9,000-t/d plant near Riyadh. Yanbu Cement Co. Ltd. proposed to increase the capacity of Clinker Line no. 4 to 8,500 t/d from 7,000 t/d and to increase its grinding capacity to 4.2 Mt/yr from 1.4 Mt/yr. Both Yanbu projects were expected to be operational by late 2005 (Middle East Economic Digest, 2004d, j; Middle East North Africa Financial Network, Inc., 2004§).

Phosphate Rock.—In 2004, Ma'aden awarded a contract to the SNC Lavalin Group, Inc. of Canada and Jacobs Engineering Group Inc. of the United States for advanced engineering services on the development of the Al-Jalamid phosphate deposit and an associated fertilizer complex at Ras al-Zhor. The Al-Jalamid facility was expected to produce 4.5 Mt/yr of phosphate concentrate from mine output of about 11 Mt/yr of phosphate rock for at least 27 years. Initial production could begin by 2008. The concentrate would be shipped on a new railroad to Ras al-Zhor where Ma'aden proposed to build a 2.9-Mt/yr diammonium phosphate plant. The Kingdom has significant but isolated phosphate rock reserves. The development of transportation infrastructure to the Al-Jalamid area will significantly enhance the feasibility of developing the phosphate resources at Umm Wu'al, which was located about 75 km west of Al-Jalamid. Resources at Umm Wu'al were estimated to be 772 million metric tons with an average grade of 18% phosphorus pentoxide (Middle East Economic Digest, 2004e; Saudi Arabia Directorate General of Mineral Resources, 1994; Saudi Arabian Information Resource, 2004§).

Mineral Fuels

In 2004, hydrocarbon discoveries included the Abu Sidr oilfield, the Midrikah gasfield, and a new gas reservoir in the Shaybah oilfield. Plans to expand the Rabigh oil refinery significantly were advanced in 2004.

The expectation that international interest would be focused on the natural gas exploration activities in Saudi Arabia was dashed after significant international attention was diverted to a controversy that concerned the long-term sustainability of Saudi oil production. Continued high international oil prices sustained the media interest in the dispute, which was primarily expounded by an analyst from the United States, about the production capacity and reserves of Saudi Arabian Oil Co. (Saudi Aramco) (Al-Husseini, 2004; Middle East Economic Digest, 2004a; Takin, 2004, Morton, 2004§; Simmons, 2004§).

Natural Gas.—The South Rub al-Khali nonassociated gas exploration joint venture of the Royal Dutch/Shell Group of the Netherlands and the United Kingdom (40% interest), Total SA of France (30%), and Saudi Aramco (30%), completed an airborne gravity survey on its 210,000-km^2 exploration block, which covered almost 11% of Saudi Arabia's 1,960,582-km^2 area. Contracts for exploration for nonassociated gas in the North Rub Al-Khali area were issued for Area A to Lukoil Saudi Arabia Energy Ltd. (Luksar), which was the company formed by OAO Lukoil of Russia (80%) and Saudi Aramco (20%); Area B to Sino Saudi Gas Ltd., which was owned by China Petroleum and Chemical Corp. (Sinopec) (80%) and Saudi Aramco (20%); and Area C to EniRepSa Gas Ltd., which was owned by ENI S.p.A. of Italy (50%), Repsol YPF SA of Spain (30%), and Saudi Aramco (20%). Luksar subsequently awarded a contract to WesternGeco (a joint venture of Baker Hughes Inc. and Schlumberger Ltd.) to shoot 8,750 km of two- and three-dimensional seismic surveys across the 29,900 km^2 Area A (Middle East Economic Digest, 2004c, g).

Petroleum.—The Kingdom embarked on a program to increase production capacity to 12.5 Mbbl/d, which would allow Saudi Arabia to maintain 1.5- to 2-Mbbl/d excess production capacity that could offset unexpected international supply disruptions. Initial projections that much of the new Saudi production capacity would be less marketable high-sulfur-content heavy oil [27° to 29° API on the American Petroleum Institute (API) density scale] were countered by Saudi Aramco's actions. The 800,000-bbl/d Abu Sa'fah/Qatif Field development program was officially commissioned in December. Production from the Abu Sa'fah/Qatif Fields was in the Arab Light (33° to 36° API) range of crude oils. Plans also were made to develop the Abu Hadriyah, the Fadhili, and the Khursaniyah oilfields at an initial rate of 500,000 bbl/d of Arab Medium in 2005 and to produce an additional 300,000 bbl/d of Arab Light from the Haradh Field in 2006. Plans were proposed to redevelop mothballed fields, which included production of about 800,000 bbl/d of Arab Medium from the Khurais Field and 300,000 bbl/d of Arab Heavy from the Manifa Field (Middle East Economic Digest, 2005; Petroleum Economist, 2005).

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Reserves

New crude oil reserves and other reserve additions essentially replaced the volume of reserves that were produced in 2004. Saudi Aramco reported that the country's crude oil reserves were about 259.7 billion barrels and that total natural gas reserves were about 6.7 trillion cubic meters. Most of Saudi Arabian natural gas reserves were associated with the country's oilfields (Saudi Arabian Oil Co., 2005, p. 46).

Outlook

With the higher oil prices received by the country in 2004, a number of new construction and mineral development projects were proposed; many have been funded and are expected to become operational in 2005 or 2006. The volume of ongoing projects will significantly increase the demand for cement and construction materials in the near term.

The domestic demand for cement has resulted in significantly decreased exports by Saudi cement companies. The sector's expansion to meet local demand coupled with the cyclical nature of construction may result in significant excess cement production capacity in the future especially because former importers of Saudi cement also have begun installation of additional cement capacity to replace the cement that formerly was imported from Saudi Arabia.

The development of alumina production capacity; the ongoing expansion of the Saudi Arabian cement, fertilizer, and steel sectors; the development of additional national railroad infrastructure; and the revised Saudi Gas Initiative will further the Government's economic diversification efforts. Most of the Kingdom's income, however, will remain dependent upon the international oil markets and, thus, be vulnerable to changes in the volume and pattern of worldwide trade in crude oil, petrochemicals, and refined petroleum products.

In 1999, when total (Saudi and non-Saudi) population was estimated to be 19.9 million, the Saudi labor force was 2.8 million and the non-Saudi labor force was 3.0 million. The Saudi unemployment rate was 8.1%. Despite the Government's Saudization program, increased labor force participation resulted in a rise in the unemployment rate in 2004, when the population was estimated to be about 25.8 million. The future demand for manpower by the expanded mineral sector is not expected to be a significant factor in the reduction of the unemployment rate (Bourland, 2002; Samba Financial Group, 2005, p. 2).

References Cited

Al-Husseini, Sadad, 2004, Rebutting the critics—Saudi Arabia's oil reserves, production practices ensure its cornerstone role in future oil supply: Oil & Gas Journal, v. 102, no. 19, p. 16-20.

Bourland, Brad, 2002, Saudi Arabia's employment profile: Riyadh, Saudi Arabia, Saudi American Bank, 5 p.

Danieli Group, 2004, Complete 850,000 tpy steelmaking plant for Rajhi Steel, Saudi Arabia: Danieli News, no. 137, March, 23 p. 7.

Lidstone, Digby, 2004, Hitting home: Middle East Economic Digest, v. 48, no. 23, June 4, p. 23-26.

Metal Bulletin, 2004, (untitled article in sidebar): Metal Bulletin, no. 8837, April 12, p. 24.

Middle East Economic Digest, 2004a, Aramco refutes reserve charges: Middle East Economic Digest, v. 48, no. 10, March 5, p. 8.

Middle East Economic Digest, 2004b, Chinese take first Saudi cement plant contract: Middle East Economic Digest, v. 48, no. 44, October 29, p. 17.

Middle East Economic Digest, 2004c, First board meeting for Rub al-Khali gas venture: Middle East Economic Digest, v. 48, no. 2, January 9, p. 12.

Middle East Economic Digest, 2004d, Gama, Polysius scoop Yamama clinker deal: Middle East Economic Digest, v. 48, no. 9, February 27, p. 21.

Middle East Economic Digest, 2004e, Group wins Al-Jalamid feasibility study: Middle East Economic Digest, v. 48, no. 1, January 2, p. 20.

Middle East Economic Digest, 2004f, Hadeed contract awards near: Middle East Economic Digest, v. 48, no. 24, June 11, p. 15.

Middle East Economic Digest, 2004g, Luksar seismic work starts: Middle East Economic Digest, v. 48, no. 42, October 15, p. 11.

Middle East Economic Digest, 2004h, Tender packages to be released at Tabuk Cement: Middle East Economic Digest, v. 48, no. 22, May 28, p. 19.

Middle East Economic Digest, 2004i, Two bid for ACC upgrade: Middle East Economic Digest, v. 48, no. 35, August 27, p. 20.

Middle East Economic Digest, 2004j, Yanbu Cement awards upgrade work: Middle East Economic Digest, v. 48, no. 22, May 28, p. 18.

Middle East Economic Digest, 2005, Aramco decides on AFK field hybrid development: Middle East Economic Digest, v. 49, no. 1, January 7, p. 8.

Midrex Technologies, Inc, 2004, Midrex and Hadeed to begin landmark project for 1.76 million ton Midrex® hot DRI plant: Charlotte, North Carolina, Midrex Technologies, Inc., Direct from Midrex, 4th Quarter, p. 9.

Petroleum Economist, 2005, Saudis drive regional production growth: Petroleum Economist, v. 72, no. 2, February, p. 20-21.

Samba Financial Group, 2005, The Saudi economy— 2004 performance, 2005 forecast: Riyadh, Saudi Arabia Samba Financial Group, 23 p.

Saudi Arabia Directorate General of Mineral Resources, 1994, Phosphate, *in* Mineral resources of Saudi Arabia: Jiddah, Saudi Arabia, Saudi Arabia Directorate General of Mineral Resources, p. 211-220.

Saudi Arabian Oil Co., 2005, Saudi Aramco 2004—Facts and figures: Dhahran, Saudi Arabia, Saudi Arabian Oil Co., 46 p.

Siemens AG, 2004, Saudi Arabian steel plant to receive power distribution and compensation equipment from Siemens: Erlangen, Germany, Siemens AG, Metals & Mining—International news 03, December, p. 9.

Takin, Manouchehr, 2004, Sustainable supply from Saudi Arabia, Iraq—Oil reserves or politics?: Oil & Gas Journal, v. 102, no. 14, April 12, p. 18-26.

Tan, Clara, 2004, Succumbing to Saudi's charms: Asia Chemical News, v. 10, no. 466, October 25, p. 10-14.

U.S. Energy Information Administration, 2005a, Table 3.3 a-h—Petroleum imports from—, *in* Monthly Energy Review September 2005: Washington, DC, U.S. Energy Information Administration, p. 48-55.

U.S. Energy Information Administration, 2005b, World crude oil production, *in* Monthly Energy Review September 2005: Washington, DC, U.S. Energy Information Administration, p. 150-151.

World Cement, 2004, Qassim Cement opts for F.L.Smidth: World Cement, v. 35, no. 4, April, p. 12.

Internet References Cited

Danieli Group, 2004, 500,000-tpy high-speed bar mill for Al Yamamah—Kingdom of Saudi Arabia, accessed December 9, 2004, at URL http://www.danieli.com/press_release/2004/agusto/aug_27_g.html.

International Monetary Fund, 2005 (September), Saudi Arabia, World Economic Outlook Database, accessed September 30, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.

MESteel.com, 2004 (September 5), Arabian Pipes Company's plans large diameter steel pipes, accessed September 20, 2004, at URL http://steelmillsoftheworld.com/ news/newsdisplay.asp?slno=1297.

Middle East North Africa Financial Network, Inc., 2004 (March 18), Saudi to build new cement plant, accessed March 23, 2004, at URL http://www.menafn.com/ qn_news_story_s.asp?StoryId=44757.

Morton, G. R., 2004 (August 16) Trouble in the world's largest oil field—Saudi Arabia's Ghawar, accessed September 1, 2004, at URL http://www.gasandoil.com/ goc.news/ntm43590.htm.

Saudi Arabian Information Resource, 2004 (October 26), SR25.5m contract awarded for phosphate project, accessed October 24, 2005, at URL http://www.saudinf.com/main/y7587.htm.

Simmons, M. R., 2004 (September 9), Twilight in the desert—The fading of Saudi Arabia's oil, accessed February 28, 2006, via URL http://www.simmonsco-intl.com/Research.aspx?Type=MSSpeechArchives.

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Smith, Campbell, 2004, Az Zabirah aluminium project—Presentation to Dubal—30th March 2004, accessed January 1, 2005, at URL www.maaden.com.sa/doc/ DubalPresentation.ppt.

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Major Publications

Arab Petroleum Research Center: Arab Oil & Gas Directory, annual.
Saudi Arabia Directorate General of Mineral Resources: Atlas of Industrial Minerals, 1993.
Mineral Resources of Saudi Arabia, 1994.
Saudi Economic Survey: Saudi Economic Survey, vol. 38, no. 1860, March 24, 2004.

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TABLE 1
SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002[e]	2003[e]	2004[e]
METALS						
Ferroalloys[e]		83,000	78,000	75,000	75,000	85,000
Iron and steel:						
Direct-reduced iron	thousand metric tons	3,090	2,880	3,290	3,290	3,410
Steel, crude	do.	2,973	3,413	3,570	3,944 [3]	3,902 [3]
Ore, mine output:						
Gross weight[e]		1,700,000	2,000,000	2,000,000	2,000,000	2,200,000
Copper content of concentrate and bullion[e]		900	800	800	800	500
Gold content of concentrate and bullion	kilograms	3,800 [e]	5,000 [e]	4,192 [3]	8,769 [3]	9,000
Lead content of concentrate[e]		50	60	60	60	30
Silver content of concentrate and bullion[e]	kilograms	9,300	15,000	14,000	13,000	6,000
Zinc content of concentrate[e]		3,000	3,300	3,000	3,000	1,500
INDUSTRIAL MINERALS						
Barite[e]		8,000	9,000	9,000	9,000	10,000
Cement, hydraulic	thousand metric tons	18,107	20,608	22,000	23,000	23,200
Fertilizer, phosphatic, P_2O_5 content[e]	do.	147	150	150	150	295
Gypsum, crude[e]		400,000	450,000	450,000	450,000	450,000
Lime[e]		350,000	350,000	350,000	350,000	350,000
Nitrogen:						
N content of ammonia	thousand metric tons	1,743	1,774	1,737 [3]	1,743 [3]	1,726 [3]
N content of urea	do.	1,214	1,260	1,241 [r, 3]	1,247 [r, 3]	1,242 [3]
Pozzolan[e]		150,000	150,000	150,000	160,000	160,000
Salt[e]		200,000	200,000	220,000 [r]	220,000 [r]	230,000
Sand and gravel[e]	thousand metric tons	120,000	120,000	120,000	120,000	150,000
Scoria[e]	do.	2,000	2,000	2,000	2,000	2,000
Sulfur, byproduct, hydrocarbon processing		2,101,391	2,350,000 [e]	2,360,000	2,180,000 [r]	2,230,000
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	54,436 [r]	58,500 [r]	63,978 [r, 3]	67,389 [r, 3]	75,967 [3]
Dry	do.	49,668 [r]	53,689 [r]	57,314 [r, 3]	60,060 [r, 3]	68,000
Natural gas liquids:[e]						
Propane	thousand 42-gallon barrels	163,000	166,000	179,000	190,000 [r]	210,000
Butane	do.	69,000	72,000	78,000	90,000 [r]	100,000
Natural gasoline and other	do.	53,000	54,000	60,000	65,000 [r]	77,000
Total	do.	285,008 [3]	292,385 [3]	316,938 [3]	345,100 [r, 3]	387,300 [3]
Petroleum:						
Crude oil	million 42-gallon barrels	2,962	2,879	2,589 [3]	3,000 [r]	3,151 [3]
Refinery products:						
Liquefied petroleum gases	thousand 42-gallon barrels	9,634	13,230	10,340 [r, 3]	10,150 [r, 3]	12,000
Gasoline and naptha	do.	155,556	152,230	153,000	171,720 [r, 3]	185,000
Jet fuel and kerosene	do.	66,920	60,050	59,700	65,550 [r, 3]	70,000
Distillate fuel oil	do.	198,176	193,770	193,000	215,590 [r, 3]	225,000
Residual fuel oil	do.	163,941	169,530	158,000	169,380 [r, 3]	190,000
Unspecified[4]	do.	8,083	8,650	9,180	10,240 [r, 3]	10,000
Total	do.	602,310	597,460	583,000	642,630 [r, 3]	692,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised.
[1]Table includes data available through October 2005.
[2]In addition to commodities listed, basalt, carbon black, clays, granite, limestone, marble, methanol, and silica sand were produced, but available information is inadequate to estimate output.
[3]Reported figure.
[4]Includes asphalt.

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The Mineral Industry of Syria

By Thomas R. Yager

The Middle Eastern nation of Syria was a producer of dimension stone, fertilizers, gravel, industrial minerals, natural gas, oil, sand, and semimanufactured minerals. Industrial minerals produced in recent years included gypsum, phosphate rock, salt, silica sand, and sulfur. Semimanufactured goods included cement, glass, phosphoric acid, steel, and sulfuric acid.

Syria's nominal gross domestic product (GDP) based on purchasing power parity was estimated to be $67.6 billion. The per capita GDP based on purchasing power parity was about $3,700. The real GDP increased by 3.4% in 2004 and 2.6% in 2003. In 2003, extractive industries accounted for 19.3% of the GDP; manufacturing, 3.7%; construction, 3.5%; and utilities, 1.7% (International Monetary Fund, 2005a, p. 4; 2005b, p. 196; 2005§[1]).

The production of semimanufactured steel rose with the opening of new steel mills in 2002 and 2003. Syria's four privately owned steel plants produced semimanufactured steel at a rate of 700,000 metric tons per year in early 2004. In the first 9 months of 2004, Joud International produced 75,000 metric tons (t) of rebar. The state-owned General Company for Iron and Steel Products produced 58,000 t of billet and 53,000 t of rebar in 2003. In 2004, the company planned to increase billet production to 60,000 t, and rebar, to 78,000 t (MEsteel.com, 2004§, 2005§).

The state-owned General Organization for Cement and Building Materials (GOCBM) and Military Housing Cement Group produced nearly 5.5 million metric tons per year (Mt/yr) of cement. GOCBM planned to increase national cement production capacity to 8 Mt/yr by 2008. By late 2005, Edhasse Sanat Corp. of Iran planned to complete a new cement plant in Hama with a capacity of 1 Mt/yr. This project was expected to cost $198 million. GOCBM also planned to build a new plant at Hama with a capacity of 1 Mt/yr (Middle East Economic Digest, 2003).

At the end of 2004, Syria's proven natural gas reserves were estimated to be about 370 billion cubic meters. The Government expected marketable natural gas production to rise to about 12.8 billion cubic meters within the next few years. The state-owned Syrian Petroleum Company (SPC) planned to develop 15 new gasfields in the Palmyra region and two new gas-processing plants. The plant near Homs would have a capacity of 2.2 billion cubic meters per year, and the plant at al-Thawra, 1.1 billion cubic meters per year (Arab Petroleum Research Center, 2004b, p. 445; BP plc, 2005, p. 20).

By May 2005, Lebanon was expected to start importing natural gas from Syria as part of the Arab Gasline project. In the first year of the project, imports were expected to be about 550 million cubic meters. Imports would rise gradually to nearly 1.1 billion cubic meters per year, and in a subsequent phase of the project, imports could rise to 2.2 billion cubic meters per year (Arab Petroleum Research Center, 2004a; Daily Star, 2005).

At the end of 2004, Syria's reserves of crude petroleum amounted to 3.2 billion barrels. Production of crude petroleum declined to 536,000 barrels per day (bbl/d) in 2004 from 564,000 bbl/d in 2003 and 579,000 bbl/d in 1999. By October 2004, production had fallen to the rate of 475,000 bbl/d. The al-Furat Petroleum Company (AFPC) was Syria's leading producer of crude petroleum; AFPC and Deir ez-Zor Petroleum Company produced light crude. SPC produced heavy crude. In 2004, the Government signed production-sharing agreements with IPR Mediterranean Exploration Ltd. for Block 24 and with Tanganyika Oil Company of Canada for the Tishreen and the Shaikh Mansour oilfields. Tishreen produced about 6,000 bbl/d; the development of Oudeh, Shaikh Mansour, and Tishreen was expected to produce an additional 30,000 bbl/d (Middle East Economic Digest, 2004; BP plc, 2005, p. 4, 6).

In 2003, Syria's production of electricity amounted to 29,533 gigawatthours (GWh) compared with 28,013 GWh in 2002 and 22,823 GWh in 1999. Natural gas accounted for 53% of the power generated in 2003; petroleum products, 37%; and hydroelectric plants, 10%. Domestic consumption of natural gas for power generation increased to nearly 4.13 billion cubic meters in 2003 from 2.92 billion cubic meters in 1999 (International Monetary Fund, 2005a, p. 22).

Outlook

Syria's production of crude petroleum has declined in recent years and is likely to continue falling in the near future. Production of natural gas is expected to increase because of higher domestic consumption and the Arab Gasline project. The expansion of the construction sector is likely to lead to higher cement production.

References Cited

Arab Petroleum Research Center, 2004a, Lebanon, *in* Arab oil & gas directory 2004: Paris, France, Arab Petroleum Research Center, p. 239-248.

Arab Petroleum Research Center, 2004b, Syria, *in* Arab oil & gas directory 2004: Paris, France, Arab Petroleum Research Center, p. 427-450.

BP plc, 2005, BP statistical review of world energy June 2005: London, United Kingdom, BP plc, 45 p.

Daily Star, 2005, Lebanon-Syria gas pipeline completed: Daily Star [Beirut, Lebanon], April 1, 1 p.

International Monetary Fund, 2005a, Syrian Arab Republic—Statistical appendix: Washington, DC, International Monetary Fund, October 3, 61 p.

International Monetary Fund, 2005b, World economic outlook—Globalization and external imbalances: Washington, DC, International Monetary Fund, April, 289 p.

Middle East Economic Digest, 2003, Danes sign up for Hama cement plant: Middle East Economic Digest, v. 47, no. 47, November 21-27, p. 21.

Middle East Economic Digest, 2004, Dublin signs PSA: Middle East Economic Digest, v. 48, no. 49, December 3-9, p. 12.

[1]References that include a section mark (§) are found in the Internet References Cited section.

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Internet References Cited

International Monetary Fund, 2005 (April), Syria, World Economic Outlook Database, accessed October 13, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/index.htm.

MEsteel.com, 2004 (April 29), Hadeed Hama to increase production of steel billets and rebars in 2004, accessed February 24, 2005, via URL http://www.mesteel.com/countries/syria/steelnews.htm.

MEsteel.com, 2005 (February 28), Joudco exports reinforcing steel bars, accessed September 14, 2005, via URL http://www.mesteel.com/countries/syria/steelnews.htm.

TABLE 1
SYRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001[e]	2002[e]	2003[e]	2004[e]
Cement, hydraulic	thousand metric tons	4,631 [r]	5,428 [r, 2]	5,450 [r]	5,450	5,450
Gas, natural:						
Gross	million cubic meters	6,934	7,800 [r]	9,100 [r]	9,300 [r]	9,300
Dry	do.	3,886	5,845 [r, 2]	6,805 [r, 2]	6,955 [r, 2]	7,000
Gypsum		333,000	370,000 [r]	370,000 [r]	370,000 [r]	370,000
Natural gas liquids:						
Propane	thousand 42-gallon barrels	511	525	760	760	760
Butane	do.	1,666	1,700 [r]	2,500 [r]	2,500 [r]	2,500
Pentanes	do.	44	45	70 [r]	70 [r]	70
Total	do.	2,221	2,270 [r]	3,330 [r]	3,330 [r]	3,330
Nitrogen:						
N content of ammonia		91,100	138,400 [2]	142,800 [2]	161,100 [2]	162,000
N content of urea		56,600	97,700 [2]	88,500 [2]	90,700 [2]	91,000
Petroleum:						
Crude	thousand 42-gallon barrels	202,000 [2]	213,500 [r, 2]	199,700 [r, 2]	205,900 [r, 2]	196,200 [2]
Refinery products:						
Liquefied petroleum gas	do.	1,633	1,310 [2]	1,430 [2]	1,370 [2]	1,400
Gasoline	do.	8,678	11,400 [2]	12,500 [2]	11,900 [2]	12,000
Naphtha	do.	4,419	4,400	4,400	4,400	4,400
Jet fuel	do.	1,457	1,500	1,500	1,500	1,500
Kerosene	do.	742	750	800	750	750
Distillate fuel oil	do.	33,176	31,000	33,000	32,000	32,000
Residual fuel oil	do.	27,467	26,800 [2]	28,900 [2]	27,700 [2]	28,000
Asphalt	do.	2,332	2,300	2,300	2,300	2,300
Other	do.	826	800	800	800	800
Total	do.	80,730	80,300	85,600	82,700	83,200
Phosphate:						
Phosphate rock, mine output:						
Gross weight	thousand metric tons	2,166	2,043 [2]	2,483 [2]	2,414 [2]	2,883 [2]
P_2O_5 content	do.	646	613 [2]	745	725	850
P_2O_5 equivalent:						
Phosphatic fertilizers		113,000	69,000	123,000 [2]	91,000 [2]	127,000 [2]
Phosphoric acid		89,000	57,000	102,000 [2]	73,000 [2]	97,000 [2]
Salt		106,130	190,000 [2]	146,000 [2]	146,000	146,000
Steel:						
Crude		70,000 [e]	70,000	70,000	70,000	70,000
Semimanufactured		60,000	60,000	400,000 [r]	600,000 [r]	800,000

See footnotes at end of table.

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TABLE 1--Continued
SYRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001[e]	2002[e]	2003[e]	2004[e]
Stone:						
Dolomite, refractory grade	thousand metric tons	4,912	5,000	5,000	5,000	5,000
Gravel and crushed rock	do.	5,549	6,000	6,000	6,000	6,000
Marble blocks		377	347 [2]	340 [2]	340	340
Sand:						
Construction	thousand cubic meters	395	450	450	450	450
Industrial	thousand metric tons	813	850	850	850	850
Volcanic tuff	do.	507	650	650	650	650
Sulfur						
Byproduct of petroleum and natural gas		16,660	16,000 [r]	16,000 [r]	15,000 [r]	15,000
Sulfuric acid:						
Gross weight		318,000	239,000 [2]	344,000 [2]	250,000 [2]	362,000 [p]
S content		104,000	78,000 [2]	112,000 [2]	82,000 [r, 2]	118,000 [p]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised.
[1]Table includes data available through September 20, 2005.
[2]Reported figure.

TABLE 2
SYRIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Tartous Company for Cement & Building Materials[1]	Tartous	1,802.
Do.		al-Chaba Cement & Building Materials[1]	Aleppo	923.
Do.		Arabian Cement Co. for Cement[1]	do.	898.
Do.		Adra Co. for Cement and Building[1]	Adra	845.
Do.		Syrian Co. for Manufacturing Cement[1]	Hama	432.
Do.		National Co. for Manufacturing of Cement[1]	Dummar	190.
Do.		Rastan Co. for Cement and Building Materials[1]	Rastan	131.
Do.		Military Housing Cement Group (Government, 100%)	Musselemieh	NA.
Natural gas	million cubic meters	ConocoPhillips Company	Processing plant at Deir ez-Zor	4,750.
Do.	do.	al-Furat Petroleum Company (Syrian Petroleum Company, 50%; Deminex GmbH, 18.8%; Pecten Syria Petroleum, 15.6%; Royal Dutch/Shell, 15.6%)	Processing plant at Omar	2,400.
Do.	do.	Syrian Petroleum Company (Government, 100%)	Processing plant at Palmyra	2,200.
Do.	do.	do.	Processing plant at Jebissa	1,060.
Do.	do.	do.	Processing plant at Suwaidiyah	240.
Nitrogen:				
Ammonia and urea[2]		General Fertilizers Company (subsidiary of General Organization for Chemical Industries)	Homs	256 ammonia; 137 urea.
Fertilizers		do.	do.	109.

See footnotes at end of table.

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TABLE 2--Continued
SYRIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Petroleum:				
Crude	thousand 42-gallon barrels	al-Furat Petroleum Company	al-Thayyem	20,000.
Do.	do.	do.	al-Izba	18,300.
Do.	do.	do.	Omar/Omar North	14,600.
Do.	do.	do.	Maleh/Azraq	11,000.
Do.	do.	do.	Sijan	11,000.
Do.	do.	do.	Jarnof/Saban	9,100.
Do.	do.	do.	al-Ward	7,300.
Do.	do.	do.	Tanak	6,600.
Do.	do.	Syrian Petroleum Company	Suwaidiyah, Jebissa, and Karatchok	45,600.
Do.	do.	Deir-ez Zor Petroleum Company (Syrian Petroleum Company, 50%, and Total S.A., 50%)	Qahar	10,200.
Do.	do.	do.	Jafra	4,700.
Do.	do.	do.	al-Mazraa and Attala North	3,700.
Do.	do.	al-Khabur Petroleum Co. (Syrian Petroleum Company, 50%)	Kishma	5,800.
Do.	do.	Tanganyika Oil Co.	Tishreen	2,190.
Refined:	do.	Banias Refinery Company (Government, 100%)	Banias	49,300.
Do.	do.	Homs Refinery Company (Government, 100%)	Homs	39,100.
Phosphate:				
Phosphate rock		General Company for Phosphate and Mines (Government, 100%)	Eastern A	1,150.
Do.		do.	Kneifis	800.
Do.		do.	Eastern B	700.
Phosphatic fertilizers		General Fertilizers Company	Homs	450
Phosphoric acid		do.	do.	165.
Salt		General Company for Phosphate and Mines	Deir al-Zour	72.
Steel:				
Billet		General Company for Iron and Steel Products (Government, 100%)	Hama	60.
Rolled		Merri Family	Tartous	300.
Do.		Arab Steel Co.	Lattakia	250.
Do.		Joud International	do.	150.
Do.		General Company for Iron and Steel Products	Hama	78.
Sulfur	metric tons	Homs Refinery Co.	Homs	14,600.
Do.	do.	do.	Processing plant at Suwaidiyah	7,410.
Do.	do.	Syrian Petroleum Company	Processing plant at Jebissa	7,300.
Sulfuric acid		General Fertilizers Company	Homs	560.

NA Not available.
[1]Subsidiary of General Organization for Cement and Building Materials, which is 100% Government owned.
[2]Expressed in nitrogen equivalent.

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THE MINERAL INDUSTRY OF TURKEY

By Philip M. Mobbs

Turkey had a diverse and dynamic mineral industry. The nation was a leading producer of barite, boron minerals, celestite (strontium), chromite, feldspar, limestone, magnesite, marble, perlite, and pumice, and was a significant source of value-added processed mineral commodities such as cement, ceramics, glass, and steel.

The national economy continued its recovery from the severe economic crisis of 2001. Inflation declined to an annual rate of 10.6% in 2004, which was a 30-year low, down from 25.3% in 2003 and 44.8% in 2002. Turkey's gross domestic product (GDP) based on purchasing power parity was estimated to be about $530 billion[1] in 2004, and the GDP per capita based on purchasing power parity was $7,503 (International Monetary Fund, 2005§[2]).

In 2004, total Turkish exports were valued at about $63.1 billion compared with $47.3 billion in 2003. Of the total exports in 2004, iron and steel accounted for about $6.0 billion; crude oil and petroleum products, $1.1 billion; nonferrous metals, $664 million; crude fertilizers and crude ores, $500 million, and metalliferous ores and metal scrap, $299.3 million. Total imports were valued at about $97.4 billion in 2004 compared with $69.3 billion in 2003. Of the total imports in 2004, crude petroleum and petroleum products accounted for $8.6 billion; iron and steel, $5.3 billion; natural gas, $4.4 billion; metalliferous ores and scrap, $3.3 billion; nonferrous metals, $2.2 billion; and coal and coke, $1.3 billion (T.C. Başbakanlık Devlet Planlama Teşkilatı Müsteşarlığı, 2005§).

Structure of the Mineral Industry

The private sector dominated the country's industrial minerals and metals sectors. Private-sector enterprises included exploration and production companies owned by domestic and foreign stockholders, mining and manufacturing subsidiaries of large Turkish conglomerates, and medium- and small-sized family-owned mining companies. In 2004, 40,919 new companies and cooperatives were established in Turkey, of which 392 were mining and quarrying companies (State Institute of Statistics, 2005§).

The Government had started procedures to privatize state-owned companies in 1986. Divestment of companies in the mineral sector (primarily cement companies) was most noticeable in 1989, 1992, 1993, and 1996. In 2004, privatization of mineral sector organizations resumed at a brisk pace. Establishments divested by the Government's T.C. Başbakanlık Özelleştirme İdaresi Başkanlığı (Privatization Administration) included the copper operations of Eti Bakir A.Ş. and the Samsun copper smelter of Karadeniz Bakir Işletmeleri A.Ş., which were sold to CE-KA İnşaat Madencilik San. ve Tic. A.Ş.; the low-carbon ferrochrome and ferrosilicon plant of Eti Elektrometalurji A.Ş., which was sold to Aksu Madencilik San. ve Tic. A.Ş.; the high-carbon ferrochrome plant of Eti Krom A.Ş., which was sold to Yıldırım Dış Ticaret ve Pazarlama A.Ş.; and the iron ore mines and iron-pellet plant of Divriği Hekimhan Madenleri San. ve Tic. A.Ş., (Div-Han), which were sold to Ereğli Demir ve Çelik Fabrikaları T.A.Ş. (Erdemir). The Privatization Administration planned to sell the 49.12% equity interest that it held in Erdemir, which operated domestic and foreign steel operations.

Also divested in 2004 were the silver mine and plant of Eti Gümüş A.Ş., which were sold to KSS Madencilik İnşaat Turizm San. ve Tic. A.Ş., and the Government's remaining 45% interest in Çayeli Bakir Isletmeleri A.Ş. (CBI), which was sold to the local subsidiary of Inmet Mining Corp. of Canada. The privatization of the petroleum refineries of Türkiye Petrol Rafineleri A.Ş. in 2004 was voided by the courts.

State-owned mineral enterprises that were expected to be sold by the Privatization Administration in 2005 included several fertilizer plants of Türkiye Gübre San. A.Ş. and the salt operations of Tütün, Tütün Mamulleri, Tuz ve Alkol İşletmeleri (TEKEL) A.Ş. Another attempt to privatize the petroleum refineries of Türkiye Petrol Rafineleri A.Ş. was expected in 2005. The Privatization Administration also was liquidating Türkiye Demir ve Çelik İşletmeleri A.Ş., which was a steel company.

Commodity Review

Metals

Bauxite and Alumina.—Karia Madencilik Muhendislik Nakliye San. ve Tic. Ltd. Şti. completed a prefeasibility study on its İkizcetepe bauxite exploration license near Mugla.

Copper.—In 2004, CBI continued to recuperate from the production disruption associated with a rockfall in 2002. A new mining plan was developed to cope with unstable ground conditions, and ore production volume was expected to recover completely in 2005. The program to deepen the mine's main shaft by 286 meters (m) was expected to be completed in early 2006 (Inmet Mining Corp., 2004, p. 5-6; 2005, p. 26-28).

In September, a fire in an underground tunnel in Eti Bakir's Küre Mine resulted in 19 fatalities and temporary suspension of mining. The tunnel, which was at a depth of 150 m, was part of the underground development of the former open pit mine that had been subcontracted to the STFA Group of Turkey.

The Anatolia Minerals Development Ltd. and Rio Tinto Mining & Exploration Ltd. joint venture drilled the Gurculer copper-gold prospect, which was part of the Bursa exploration project in western Turkey, and the Karapinar, the Kizilviran, and

[1]Where necessary, values have been converted from Turkish lira (TL) to U.S. dollars (US$) at the average rate of TL1,448,899=US$1.00 for 2004 and TL1,528,854=US$1.00 for 2003.

[2]References that include a section mark (§) are found in the Internet References Cited section.

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the Sin copper-gold prospects in the Tunceli exploration area in central Turkey.

In 2004, the feasibility study was completed on CBI's Cerattepe exploration license, which was located near Artvin in northeastern Turkey. Based on probable reserves of 1.6 million metric tons (Mt) at grades of 8.8% copper, 1% zinc, 0.3% lead, 33 grams per metric ton (g/t) silver, and 1.4 g/t gold, a plan was developed to mine the deposit at the rate of about 250,000 metric tons per year (t/yr). Production could begin as soon as late 2006, and the proposed underground mine would employ about 90 people (Inmet Mining Corp., 2004, p. 7-8).

In 2004, the Ciner Group, formerly the Park Group, acquired the rights to develop the Siirt-Sirvan copper deposit in southeastern Turkey. The site originally had been mined at least 2,600 years ago. Nuinsco Resources Ltd. acquired an option from Noranda Inc. for the Berta copper-gold prospect near Artvin. Noranda completed a soil-sample program on the property in 2004 (Kaptan, 1990; Nuinsco Resources Ltd., 2004).

Gold.—Legal problems continued for the Ovacik gold mine, which had opened in 2001. The Ovacik Mine, which was located near the north end of Turkey's Turquoise Coast tourist area in western Turkey about 106 kilometers (km) north of Izmir, was owned and operated by Normandy Madencilik A.Ş. In June, Frontier Pacific Mining Corp. of Canada agreed to acquire Normandy from a subsidiary of Newmont Mining Corp. of the United States. In August, operations at Ovacik were suspended after a court decision required additional operating permits and the submission of an updated environmental impact assessment (EIA) report. The paperwork was filed and the mine appeared ready to reopen, but in October, Normandy's appeal of a lower court's decision to prohibit the use of cyanide at Ovacik was denied. Operations remained suspended at yearend (Mining Journal, 2004).

Cyanide was used by other mining operations in Turkey. The lower court ruling applied to the Ovacik Mine, which was located in a tourist region. If an extension of the prohibition of the use of cyanide for gold mining operations were to be applied to other projects, it would have a significant chilling effect on proposed gold mines in Turkey.

The Government expressed support of the gold mining sector in June when it amended the value-added tax (VAT) law. Companies in the gold, platinum, and silver sectors were exempted from paying VAT on goods and services related to exploration, production, and refining operations (PricewaterhouseCoopers International Ltd., 2004, section 5.2.1).

Eldorado Gold Corp. started construction of the Kisladag gold mine, which was located about 180 km east of Izmir. Production was expected to begin in late 2005. Eldorado continued the preparation of an EIA for the Efemçukuru project, which was located about 20 km from Izmir in western Turkey. Eldorado's subsidiary Tüprag Metal Madencilik San ve. Tic. Ltd. Şti. mapped and sampled several deposits on Tüprag's Western Pontides licenses.

Several other companies also were exploring for gold in Turkey. Aldridge Minerals Inc. of Canada completed a 1,000-m-reverse-circulation drill program on the Derinköy and the Olucak properties in 2004. Derinköy was located about 30 km southeast of Artvin in northeastern Turkey, and Olucak was located 75 km west of Trabzon in northeastern Turkey. Aldridge had acquired options on the properties from BHP Billiton World Explorations Inc. Aldridge also acquired an option on the Yenipazar property in central Turkey from Anatolia Minerals Development Inc.

In January, Anatolia Minerals acquired 100% interest in the Çöpler gold prospect. The Çöpler prospect was located about 500 km east-southeast of Ankara in central Turkey. Anatolia subsequently completed a more-than-200-hole reverse-circulation drill program. Based on the drill results, Anatolia announced a new resource estimate for the Çöpler prospect, which included measured and indicated recoverable oxide resources of 5.51 Mt at an average grade of 2.02 g/t gold and inferred recoverable oxide resources of 13.34 Mt at an average grade of 2.56 g/t gold (Anatolia Minerals Development Inc., 2004).

In September, Eurasian Minerals Inc. of Canada formed a 4-year strategic alliance with Barrick Gold Corp. under which Eurasian's subsidiary Eurasian Madencilik Ltd. would operate a regional exploration program in Turkey for the partners. Eurasian explored several prospects in 2004.

Fronteer Development Group Inc. of Canada acquired options on the Agi Dagi and the Kirazli gold properties in western Turkey from Teck Cominco Arama ve Madencilik San. Tic. A.Ş. In 2004, Fronteer began a 6,000-m drill program at Agi Dagi and a 3,000-m drill program at Kirazli. Fronteer ended the initial Kirazli program after three holes and proposed to begin a new 5,000-m diamond drill program in February 2005 (Fronteer Development Group Inc., 2004, 2005).

Odyssey Resources Ltd. drilled the Altintepe and the Tavsan gold properties. Altintepe, which is located in northeastern Turkey, and Tavsan, which is located in western Turkey, had been optioned from Teck Cominco.

Iron and Steel.—More than 70% of Turkish steel production capacity was attributed to electric arc furnace (EAF) minimills. In 2004, the increased costs of power and domestic and imported steel scrap adversely affected Turkish EAF plants. The country's three integrated steel plants, which employed about 19,000 workers, also were affected by rising fuel and iron ore prices.

In an attempt to control iron ore prices more effectively, Erdemir, which was the leading integrated steel company in Turkey, acquired Div-Han, which produced iron ore and pellets, from the Privatization Administration. Div-Han subsequently was renamed Erdemir Madenclik San. ve Tic. A.Ş. In 2004, Erdemir also inaugurated a train ferry to connect the docks of the seaside steel plant to the Turkish State Railway.

Erdemir continued work on the expansion of its hot-rolling mills and the installation of a plate mill. In 2002, Erdemir had acquired 90.87% equity in the integrated steel producer İskenderun Demir ve Çelik Fabrikaları A.Ş. (Isdemir) from the Privatization Administration. In 2004, Isdemir completed the modernization of its wire-rod mill. Ongoing work at Isdemir that was expected to be completed in 2006 included the rehabilitation of blast furnace No. 3, which would increase the plant's iron ore requirement; the installation of coke batteries No. 5 and 6, which would add 1.3 million metric tons per year

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(Mt/yr) of coke production capacity to the plant; the installation of a 219,000-t/yr lime plant; and the installation of a 2.5-Mt/yr capacity slab caster. A program to expand Isdemir's steel production capacity to 5.25 Mt/yr from 2.2 Mt/yr was expected to be completed by 2010. The project to convert Isdemir to a producer of flat steel products from the current (2004) long products configuration had been tendered and evaluation of the bids was underway (İskenderun Demir ve Çelik Fabrikaları A.Ş., 2005, p. 19-20, 23-26; Ereğli Demir ve Çelik Fabrikaları T.A.Ş., 2005§).

In 2004, the minimill Çolakoğlu Metalurji A.Ş. proposed to install a 2-Mt/yr slab caster at its plant in Gebze that would allow the company to begin production of flat steel instead of only long products such as reinforcing bar and rod. Ege Çelik San. ve Tic. A.Ş. of Izmir proceeded with the installation of a new billet caster, and Kroman Çelik San. A.Ş. proceeded with the installation of a new bar and rod mill at its plant in Gebze (Danieli Group, 2004§; Voest-Alpine Industrienalagenbau AG, 2004§, 2005§).

Nickel.—Bosphorus Nickel Madencilik Turzim A.Ş , which was a subsidiary of European Nickel plc of the United Kingdom (97.7% equity interest) and As Krom Madencilik Turzim Lusaat Nakliye San. ve Tic. A.Ş. of Turkey (2.3%), continued its evaluation of the Caldag lateritic nickel deposit near Izmir. In 2004, Bosphorus Nickel began the first of three trial heap-leach projects at Caldag and expected to complete a bankable feasibility study of the project in 2005. A positive study would advance the planned construction of a nickel-cobalt hydroxide plant. Production could begin in 2007 at the rate of 15,000 t/yr of nickel and 800 t/yr of cobalt contained in the hydroxide, which would be exported for further processing (European Nickel plc, 2005, p. 2, 6).

After completing a due diligence review, a trial mining program, and processing of a second 3,500-metric-ton (t) ore shipment, Oriel Resources plc of the United Kingdom withdrew from its Gordes nickel venture with Meta Madencilik Sanayi Enerji Turizm İç ve Dış Ticaret Ltd. Şti. (Meta Madencilik Sanayi Enerji Turizm İç ve Dış Ticaret Ltd. Şti., undated§).

Zinc.—In 2004, ZincOx Resources plc of the United Kingdom completed a prefeasibility study and began a bankable feasibility study of its Aliaga Recycling Project. ZincOx proposed to build a plant to process EAF dust and to recover 12,000 t/yr of zinc oxide. Production was expected to begin in 2007. The proposed location at Aliaga was near five steel minimills that used EAFs to melt steel scrap (ZincOx Resources plc, 2005, p. 8-9).

Industrial Minerals

Boron and Sulfur.—In 2004, Government-owned Eti Holding A.Ş changed its name to Eti Maden İşletmeleri Genel Müdürlüğü. Based on the results of a new 5,650-m drill program, Eti reported that the gross weight of its boron reserves were increased to about 3 billion tons. The grade of Turkish boron deposits ranged from about 24% B_2O_3 to 46% B_2O_3 (Erseçen, 1989, p. 39; Eti Maden İşletmeleri Genel Müdürlüğü, 2005, p. 16; Maden Tetkik ve Arama Genel Müdürlüğü, undated§).

In 2004, Eti officially opened the 100,000-t/yr-capacity Emet boric acid plant. By yearend, Eti had begun an expansion program to raise the capacity of the Emet plant to 120,000 t/yr. Also in 2004, Eti completed the 240,000-t/yr-capacity Bandirma sulfuric acid plant, which—unlike most sulfuric acid plants—would process pyrite. The company also began the expansion of the 650,000-t/yr Bigadiç Boron Works with the construction of a third concentrator that would add 325,000 t/yr of processing capacity to the Bigadiç plant. Natural gas pipelines to the Emet Boron Works and the Kirka Boron Works were under construction. Conversion of the Emet and Kirka facilities to natural-gas-fueled plants was expected to be completed in 2005. Eti also continued work on the 100,000-t/yr-capacity Bigadiç II boron grinding unit and proposed to build a 15,000-t/yr anhydrous borax plant at Kirka and a 5,000-t/yr boron oxide plant. At Bandirma, Eti proposed to expand the capacity of the 100,000-t/yr borax decahydrate plant to 145,000 t/yr and to expand the capacity of the 20,000-t/yr sodium perborate plant to 34,000 t/yr (Eti Maden İşletmeleri Genel Müdürlüğü, 2005, p. 16-17).

Soda Ash.— Soda Sanayii A.Ş., which was adversely affected by rising fuel oil prices in 2004, initiated plans to convert the powerplant at its Mersin soda ash facility to burn natural gas; gas was scheduled to become available in 2005 when the Government pipeline company Boru Hatlari Ile Petrol Taşima A.Ş. expected to complete the 715-km Southern Natural Gas Transmission Line from Silvas to Mersin (Türkiye Şişe ve Cam Fabrikaları A.Ş., 2005, p. 25; Boru Hatlari Ile Petrol Taşima A.Ş., 2004§).

In June, Eti Soda Üretim Paz. Nak. ve Tic. A.Ş. [a venture of the Ciner Group (73.96% equity interest), Eti Maden (26%), and Türkiye Vakifbank Bankasi T.A.O. (0.04%)] opened a pilot soda ash plant at Beypazari, which was located about 115 km from Ankara. Trona was extracted by solution mining. Commercial production at the rate of 500,000 t/yr was scheduled to begin in 2007 (Eti Maden İşletmeleri Genel Müdürlüğü, 2004§).

In 2004, Rio Tinto interpreted three-dimensional seismic data that had been shot across the Kazan trona prospect, which was located 35 km northwest of Ankara. Construction of wells for solution mining and 1-Mt/yr-capacity processing facilities at Kazan was expected to begin in 2005 (Walsh, 2004§).

Mineral Fuels

Natural Gas and Petroleum.—State-owned Türkiye Petrolleri A.O. (TPAO) was the country's leading oil producer. Most of TPAO's crude oil production was in the southeastern region; there were 29 producing gasfields and oilfields in the Batman area and another 20 oilfields in the vicinity of Adiyaman. The Thrace region in northwestern Turkey hosted primarily natural gas fields.

Offshore and onshore exploration continued, primarily in northwestern and southeastern Turkey. Offshore, the joint venture of BP plc and TPAO evaluated seismic data across the Eastern Black Sea project, and the joint venture of Madison Oil Turkey Inc. and TPAO acquired additional seismic data and discovered gas in the Ayazh-1 well on the Western Black Sea project acreage.

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Outlook

Turkey's location at the eastern end of the Mediterranean Sea positions the country as a conduit for trade among Europe, the countries in the eastern Commonwealth of Independent States (CIS), and the Middle East. Bridging Asia and Europe, the 780,580-square-kilometer Turkey also is a major energy transit corridor. Natural gas from Iran and Russia is piped into Turkey, and the proposed South Caucasus gas pipeline is to begin deliveries of natural gas to Turkey from Azerbaijan. Connection of the Turkish natural gas pipeline system with the European gas network could provide an alternative route for surplus Eurasian and Iranian natural gas to flow into Europe.

Crude oil from Iraq intermittently moved through Turkey in 2004; the frequent sabotage of the Iraqi section of the pipeline limited pumping operations. Increased pipeline security in Iraq in 2005 would allow increased pipeline throughput. The Baku-Tbilisi-Çeyhan oil pipeline is expected to be operational in 2005 and to increase oil exports (and marine traffic) through the Port of Çeyhan, Turkey, significantly.

The Government continued discussions with the Russian Government concerning the increased oil tanker traffic through the Bosporus and the Dardanelles. Construction of oil pipelines across Thrace from the Black Sea to the Aegean Sea or across central Turkey from Samsun to Çeyhan would reduce the number of oil tankers that carry Russian oil through the Turkish Straits.

In 2004, the population of Turkey was estimated to be about 69 million, and the unemployment rate was reported to be 12%. Renewed growth of the labor-intensive construction sector is expected to benefit Turkey's employment rate and the country's aggregate, cement, clays, steel, and stone companies. The recent economic expansion resulted in record Turkish motor vehicle production; 823,000 vehicles were built in 2004. Continuation of the economic expansion is expected to increase the demand for private automobiles. In addition to the increased demand for steel products, the associated increased demand for glass for cars resulted in Trakya Cam San. A.Ş.'s proposal to add a fifth float glass line with production expected to begin in 2006. Trakya Cam employed about 2,000 employees on the four existing (2004) glass lines.

The Government's ongoing privatization program is expected to rejuvenate operations in the mineral sector. In 2004, most privatized mineral companies were sold to domestic organizations, but between June 2003, when the Foreign Direct Investment Law No. 4875 was enacted, and December 2004, 14 firms in the mining sector attracted $689 million of new foreign investment (Boland, 2004; T.C. Başbakanlık Hazine Müsteşarlığı, 2005, p. 14; U.S. Central Intelligence Agency, 2004§).

References Cited

Anatolia Minerals Development Inc., 2004, New estimate confirms Çöpler oxide resource: Lakewood, CO, Anatolia Minerals Development Inc. press release, December 2, 2 p.

Boland, Vincent, 2004, Calm threatens after the storm, *in* FT Turkey—Finance: Financial Times [London, United Kingdom], April 27, p. 2.

Erseçen, Necdet, 1989, Known ore and mineral resources of Turkey: Ankara, Turkey, Maden Tetkik ve Arama Genel Müdürlüğü, Report no. 185, 108 p.

Eti Maden İşletmeleri Genel Müdürlüğü, 2005, 2004 annual report: Ankara, Turkey, Eti Maden İşletmeleri Genel Müdürlüğü, 26 p.

European Nickel plc, 2005, Annual report 2004: London, United Kingdom, European Nickel plc, 40 p.

Fronteer Development Group Inc., 2004, Fronteer intersects 12.23 g/t gold over 39.4 metres on first hole of current drill program at Kirazli property: Vancouver, British Columbia, Canada, Fronteer Development Group Inc. news release 04-35, December 2, 2 p.

Fronteer Development Group Inc., 2005, Fronteer intersects 4.07 g/t gold over 22.9 metres in second hole at Kirazli: Vancouver, British Columbia, Canada, Fronteer Development Group Inc. news release 05-01, January 11, 2 p.

Inmet Mining Corp., 2004, Inmet Mining announces third quarter earnings of $0.57 per share: Toronto, Ontario, Canada, Inmet Mining Corp. press release, October 28, 34 p.

Inmet Mining Corp., 2005, Annual report 2004: Toronto, Ontario, Canada, Inmet Mining Corp., 120 p.

İskenderun Demir ve Çelik Fabrikaları A.Ş., 2005, İsdemir annual report 2004: İskenderun, Turkey, İskenderun Demir ve Çelik Fabrikaları A.Ş., 67 p.

Kaptan, Ergun, 1990, Findings related to the history of mining in Turkey: Bulletin of the Mineral Research and Exploration Institute of Turkey, no. 111, p. 75-84.

Mining Journal, 2004, Court rejects Ovacik: Mining Journal, October 8, p. 7.

Nuinsco Resources Ltd., 2004, Nuinsco announces 15-kilometer area of alteration and widespread copper-gold mineralization outlined on Berta Project—Turkey: Toronto, Ontario, Canada, Nuinsco Resources Ltd. press release, November 9, 2 p.

PricewaterhouseCoopers International Ltd., 2004, Turkey—A VAT guide: Istanbul, Turkey, PricewaterhouseCoopers, December, unpaginated.

T.C. Başbakanlık Hazine Müsteşarlığı, 2005, Foreign investment report: Ankara, Turkey, T.C. Başbakanlık Hazine Müsteşarlığı, 25 p.

Türkiye Şişe ve Cam Fabrikaları A.Ş., 2005, 2004 annual report: Istanbul, Turkey, Türkiye Şişe ve Cam Fabrikaları A.Ş, 72 p.

ZincOx Resources plc, 2005, Preliminary results—Year ended 31 December 2004: Bagshot, United Kingdom, ZincOx Resources plc, May, 20 p.

Internet References Cited

Boru Hatlari Ile Petrol Taşima A.Ş., 2004, Investments, accessed September 14, 2005, via URL http://www.botas.gov.tr/investments.

Danieli Group, 2004 (October 26), New 500,000-tpy bar, rod and spooled bar-in-coil mill for Kroman Çelik Sanayii—Turkey, accessed December 9, 2004, at URL http://www.danieli. com/press_release/2004/ottobre.oct_26_b.html.

Ereğli Demir ve Çelik Fabrikaları T.A.Ş., 2005, 2004 annual report, accessed September 16, 2005, via URL http://www.erdemir.com.tr/faaliyet_2004/index.html.

Eti Maden İşletmeleri Genel Müdürlüğü, 2004 (May 30), 30 Mayıs 2004 tarihinde işletmeye alınan Beypazrı Trona yatakları—Cözelti madenciliği ile soda külü üretimi pilot tesisiinin açılışı yapıldı [Operations at the Beypazrı Trona deposit established as of May 20, 2004], accessed January 24, 2005, at URL http://www.etiholding.gov.tr/tr/0_sayfa_ortakSayfa.asp?hangiSayfa=1608_sayfa.

International Monetary Fund, 2005 (April), Turkey, World Economic Outlook Database, accessed May 3, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

Maden Tetkik ve Arama Genel Müdürlüğü, [undated], Türkiye maden rezervleri [Mineral reserves of Turkey], accessed January 29, 2005, at URL http://www.mta.gov.tr/madenler/turmaden/tur_rez.asp.

Meta Madencilik Sanayi Enerji Turizm İç ve Dış Ticaret Ltd. Şti., [undated], Gördes nickel project summary, accessed September 19, 2005, at URL http://www.metamaden.com/project.htm.

State Institute of Statistics, 2005 (January 25), Number of newly established and liquidated companies by economic activity and selected provinces—Cumulative Turkey 2004, accessed May 9, 2005, at URL http://www.die.gov.tr/ENGLISH/SONIST/SIRKET/250105ingt4.gif.

T.C. Başbakanlık Devlet Planlama Teşkilatı Müsteşarlığı, 2005 (March), Main economic indicators, Part 5— Foreing[sic] trade and balance of payment, accessed May 10, 2005, via URL http://ekutup.dpt.gov.tr/teg/2005/03/mei.html.

Digitized by Google

U.S. Central Intelligence Agency, 2004, Turkey, accessed September 13, 2005, at URL http://www.brainyatlas.com/geos/tu.html.
Voest-Alpine Industrienalagenbau AG, 2004 (September 20), VAI—21 million euro orders for rolling mill orders, accessed September 20, 2004, at URL http://www.vatech.at/view.php3?f_id=13953&LNG=EN&nl=1.
Voest-Alpine Industrienalagenbau AG, 2005 (March 1), Further major orders from India, Japan, Korea and Russia for VAI worth a total of EUR 200 m, accessed March 1, 2005, at URL http://www.vatech.at/view.php3?f_id=14725&LNG=EN&nl=1.
Walsh, H.S., 2004 (July 19), Economic impact policy, accessed September 10, 2004, at URL http://a257.g.aka.aitech.net/7/257/2422/06jun20041800/edocket.access.gpo.gov/2004/01-16311.htm.

Major Sources of Information

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TABLE 1
TURKEY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
METALS						
Aluminum:						
Bauxite[2]		458,537	242,040	287,403	364,306	365,836
Alumina:						
Gross weight		155,448	145,993	152,869	162,174	169,991
Metal, smelter[e]		61,000	61,730 [3]	62,501 [r, 3]	63,000	60,000
Antimony:[e]						
Ore, mine output:						
Gross weight		6,800	6,300 [r]	4,800 [r]	12,500 [r]	20,107 [3]
Sb content		360	330 [r]	250 [r]	650 [r]	900
Concentrates:						
Gross weight		1,000	1,000	1,000	2,000 [r]	2,500
Sb content		200	200	150	400 [r]	500
Chromium, gross weight (34% to 43% chromic oxide)[4]		545,725	389,759	313,637	229,294 [r]	506,421
Copper:						
Mine output, exclusive of pyrite:[5]						
Gross weight		4,473,711	3,467,306	2,942,721	2,620,896	2,356,147
Cu content of ore		76,053	56,864	48,253	58,000 [r, e]	49,000 [e]
Metal:						
Smelter output, primary and secondary		32,550	33,504	32,550	30,400 [r, e]	11,500 [e]
Refined[e]		64,100	58,400	41,000	45,000	50,000
Gold[e, 6]	kilograms	500	2,000	5,000 [r]	6,500 [r]	4,500
Iron and steel:						
Iron ore:						
Gross weight	thousand metric tons	4,076	3,932	3,433 [r]	3,429 [r]	3,857
Fe content[e]	do.	2,200	2,100	1,830 [r]	1,830 [r]	2,060
Metal:						
Pig iron and ferroalloys:						
Ferrochromium		97,240	50,735	11,200	35,393 [r]	28,701
Ferrosilicon		--	5,895	7,245	7,000 [e]	--
Pig iron		300,000 [e]	247,598	157,622	181,080	213,210
Steel, crude including castings	thousand metric tons	14,325	14,382	16,046	18,298 [r]	19,868
Lead:						
Mine output, Pb and Pb-Zn ores:						
Gross weight		345,391	388,795	375,592	379,250	407,637
Pb content		17,270	17,923	17,352	17,500	18,650
Concentrates:[e]						
Gross weight		13,000	13,000	13,000	13,000	14,000
Pb content		8,500	8,500	8,500	8,500	9,100
Metal, refined[e]		4,000	4,000	4,000	6,000	6,000
Manganese ore, gross weight[7]		23,300	20,000	20,000	18,000	13,751
Nickel, mine output, Ni content[e]		--	NA	NA	640	--
Silver, mine output, Ag content[8]	kilograms	110,000 [e]	118,000 [r]	79,000 [r]	95,000 [r]	73,000 [e]
Zinc:						
Mine output, Zn and Cu-Zn ore:						
Gross weight	thousand metric tons	861	816	895 [r]	930 [r]	765
Zn content	do.	39	37	46 [r]	47 [r]	44
Concentrates:[e]						
Gross weight		26,000 [r]	25,300 [r]	33,100 [r]	33,600 [r]	33,400
Zn content		26,000 [r]	25,300 [r]	33,100 [r]	33,600 [r]	33,400
INDUSTRIAL MINERALS						
Aluminum sulfate, alunite		12,266	11,531	11,389	10,458	10,920
Barite, crude		120,893	57,373	106,843	119,648	134,504
Boron minerals:						
Run of mine		2,398,220	2,357,592	2,214,064	2,207,092	2,878,930
Concentrates		1,402,000	1,493,361	1,368,000 [r]	1,399,000 [r]	1,697,000
Refined borates		435,000	420,000 [e]	436,000	518,000 [r]	715,000
Cement, hydraulic	thousand metric tons	35,825	30,125	32,576	35,077	38,019

See footnotes at end of table.

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TABLE 1--Continued
TURKEY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
INDUSTRIAL MINERALS--Continued						
Clays:						
Bentonite		636,273	674,178	559,224	831,146	850,000 [e]
Kaolin		595,415	574,550	372,344	370,455	536,008
Other[e]		6,500,000	2,506,061 [3]	2,500,000	2,500,000	2,750,000
Diatomite		10,000	10,000	10,000	10,000	10,000
Emery		16,830	13,629	15,418	15,402	7,902
Feldspar, run of mine		1,147,716	1,510,293	1,766,387	1,862,310	1,983,336
Fluorspar		4,113	4,093	5,344	718 [r]	880
Glass, crude	thousand metric tons	1,300 [e]	1,141 [r]	1,242 [r]	1,315 [r]	1,229
Graphite, run of mine[e]		15,000	15,000	1,393 [3]	942 [3]	1,000
Gypsum, other than that for cement		302,552	328,656	264,038	196,668	250,099
Lime[e, 9]	thousand metric tons	3,300 [r]	3,200 [r]	3,300 [r]	3,300 [r]	3,400
Magnesite, run of mine		2,672,089	1,450,031	3,044,440	3,224,278	3,732,952
Meerschaum[e]	kilograms	500	400	300	200	150
Nitrogen, N content of ammonia		53,400 [e]	67,100 [e]	300,500	289,300	329,400
Perlite, run of mine		149,429	70,738	151,902	136,683	133,829
Pumice		787,081	754,052	820,347	895,616	1,035,975
Pyrites, cupreous, gross weight		561,565	662,872	952,094	1,103,872	765,432
Silica sand, gross weight	thousand metric tons	1,485	1,207	1,274	1,283	1,188
Sodium compounds:						
Salt, NaCl, all types	do.	2,126	1,771	2,197	2,243	2,158
Soda ash, trona[e]	do.	620	640	825 [r]	835 [r]	846
Sodium sulfate, concentrates		456,590	300,000 [e]	562,660	556,575	523,285
Stone:						
Dolomite		957,182	915,441	975,971	1,158,539	2,109,362
Limestone, other than for cement	thousand metric tons	30,295	40,572	30,261	28,609	30,963
Marble	cubic meters	647,160	460,834	557,630	544,629	668,996
Quartzite		2,743,271	2,085,791	2,006,654	2,908,584	2,961,932
Strontium minerals, celestite:[e]						
Run of mine		40,000	110,000	116,278 [3]	116,000 [3]	100,000
Concentrates		24,150 [3]	63,635 [3]	70,000	70,000	60,000
Sulfur:[e]						
S content of pyrites		45,000 [r]	26,000 [r]	43,000 [r]	50,000 [r]	35,000
Byproduct:						
Petroleum		43,000	51,000	48,000 [3]	42,000 [r]	49,000 [3]
Other		75,000	75,000	75,000	72,000	72,000
Total		163,000	152,000	166,000 [r]	164,000 [r]	156,000
Talc		54,278	883	98	60 [r]	60
MINERAL FUELS AND RELATED MATERIALS						
Asphalt, natural		150,000 [e]	150,000 [e]	118,235	217,759	738,915
Carbon black		35,144	35,000	37,413 [r]	6,754	32,686
Coal:						
Hard coal, run of mine	thousand metric tons	3,330	3,370	3,313	3,090	2,843
Lignite, run of mine	do.	61,315	58,173	49,627	43,749	43,754
Coke and semicoke	do.	2,090	1,890	2,080	2,543	2,855
Gas, natural, marketed	thousand cubic meters	611,822	600,000 [e]	268,000 [e]	275,947	344,196
Petroleum:						
Crude	thousand 42-gallon barrels	19,783	18,370	17,579	16,980	16,270
Refinery products:						
Liquefied petroleum gas	do.	7,409	8,019	8,580	7,960 [r]	8,340
Gasoline	do.	39,889	24,993	31,634	28,800	27,350
Naphtha	do.	15,717	16,656	11,947	10,700 [r]	12,700
Jet fuel	do.	11,009	9,496	9,368	13,300 [r]	14,000
Kerosene	do.	638	209	312	540 [r]	340
Distillate fuel oil[10]	do.	70,333	58,901	59,281	53,800 [r]	53,660
Lubricants	do.	4,322	1,736	2,090	1,960 [r]	2,050
Residual fuel oil	do.	8,769	56,323	53,077	38,600 [r]	40,270
Asphalt	do.	7,764	6,661	7,548	8,550 [r]	8,430
Unspecified[11]	do.	3,110	5,969	6,125	2,640 [r]	3,610
Total	do.	168,960	188,963	189,962	166,850 [r]	170,750

See footnotes at end of table.

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TABLE 1--Continued
TURKEY: PRODUCTION OF MINERAL COMMODITIES[1]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. NA Not available -- Zero.

[1]Table includes data available through September 12, 2005. In addition to the commodities listed, large quantities of construction materials (clay, sand, and gravel) are quarried. Also mined are basalt, diabase, granite, onyx, sandstone, serpentine, slate, and travertine for building stone, limestone and gypsum for cement manufacture, and molybdenum, olivine, titanium, tungsten, and zeolite, but information is inadequate to estimate output.

[2]Data are for public sector production only. Data for private sector production are not available, but production is believed to be approximately 30,000 metric tons per year.

[3]Reported figure.

[4]Approximately 70% of gross production is salable product.

[5]Copper mines produce a copper concentrate (of about 22% Cu) and a cupreous pyrite concentrate (of about 0.7% Cu). Copper is not recovered from the cupreous pyrite concentrate.

[6]Data includes estimated content of Turkish copper refinery tankhouse slimes. Prior to 2001, all gold production was the byproduct of base-metals refining.

[7]Does not include manganiferous iron ore from the Deveci Mine, production of which amounts to several hundred thousand metric tons per year and has a manganese content of 3% to 5%.

[8]Includes estimated content of base-metals-refinery tankhouse slimes.

[9]Estimated sales only.

[10]Diesel fuel (gasoil) and special heating oil.

[11]Includes refinery fuel and losses.

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The Mineral Industry of the United Arab Emirates

By Philip M. Mobbs

The production of natural gas and crude oil and international and regional trade were significant facets of the economy of the United Arab Emirates[1] (UAE). Of the seven emirates, Abu Dhabi accounted for most of the country's crude oil production; Dubai, Ras Al-Khaimah, and Sharjah also produced hydrocarbons. Other minerals and mineral commodities produced in the UAE included aluminum and steel manufactured in Dubai; ammonia manufactured in Abu Dhabi; cement manufactured in Abu Dhabi, Ajman, Dubai, Fujairah, Ras Al-Khaimah, and Sharjah; chromite mined in Fujairah; and stone quarried in Ras Al-Khaimah. Also, ceramic tiles, glass, and gypsum were produced in various Emirates. All mineral resources were controlled by the individual Emirates and administered by the Federal Government.

The UAE had an estimated GDP based on purchasing power parity of about $103.6 billion[2] and a GDP per capita based on purchasing power parity of $23,818. In 2004, crude oil, natural gas, and other mineral production accounted for 29.2% of the GDP; the manufacturing sector (which included the production of liquefied natural gas, refined petroleum, and rolled steel products) accounted for 13.9%, and the construction sector, 7.8%. Total population was estimated to be more than 4.3 million in 2004, primarily in Abu Dhabi (1.7 million), Dubai (1.3 million), and Sharjah (0.7 million). Of the country's labor force of 2.5 million, 497,974 worked in the construction sector, 319,384 in the manufacturing sector, 30,015 in the crude oil and natural gas sector, and 5,560 in quarrying. About 25% of the country's population was less than 15 years old (Central Bank of the United Arab Emirates, 2005, p. 18, 20, 22; International Monetary Fund, 2005§[3]).

Trade

In 2004, the UAE's total exports (free-on-board), which included reexports, were valued at $82.8 billion, which was up significantly from a revised $67.2 billion in 2003 and $49.6 billion in 2002. The value of total imports (cost, insurance, and freight) in 2004 was estimated to be $61.6 billion. The value of crude oil exports from the UAE was estimated to be $29.6 billion in 2004 compared with $22.1 billion in 2003. In 2004, crude oil exports accounted for about 35.8% of the value of total exports compared with 32.9% in 2003. Natural gas exports were valued at $4.7 billion (5.7% of total exports) in 2004, and refined petroleum product exports were valued at $4.1 billion (5% of total exports). Much of the increase in the value of crude oil exports could be attributed to an increase in the average price received per barrel of crude, which was $36.1 per barrel in 2004 compared with $28.1 per barrel in 2003 and $24.7 per barrel in 2002. Reexports (the UAE was a significant transshipment point for the Gulf region) accounted for 33.5% of total exports in 2004 compared with 33.5% in 2003 and 29.4% in 2002 (Central Bank of the United Arab Emirates, 2005, p. 34, 36).

In 2004, Dubai, which was a major regional trading center for gold, imported about 503.5 metric tons (t) of gold and exported 260.9 t. In 2003, 373.8 t of gold was imported and 121.7 t exported. The Dubai Diamond Exchange opened in April 2004 (Dubai Metals & Commodities Centre, 2005§).

Much of the cross-border trade between member States of the Cooperation Council for the Arab States of the Gulf (GCC) traveled by road or by sea. In October, a feasibility study was proposed for the construction of a more-than-2,000-kilometer railroad to Kuwait from Muscat, Oman. The proposed track would pass through the 82,880-square-kilometer UAE and Saudi Arabia (Middle East Economic Digest, 2004c).

Commodity Review

The demands of the construction industry revitalized the UAE's nonfuel mineral sector. In 2004, the average price of cement rose 52.7% to $3.67 per bag, the average price of aggregate increased 45.6% to $9.58 per metric ton, and the average price of concrete-reinforcing bar (rebar) increased 44.4% to $534.25 per metric ton (Thompson, 2004).

Offshore Dubai, construction continued on The Palm Jebel Ali and The Palm Jumeirah developments. In 2002 and 2003, about 200 million cubic meters of rock and sand quarried in (or offshore) the UAE was used to build the offshore islands that comprise the project. At yearend 2004, proposed commercial and residential construction projects were estimated to cost more than $52 billion. Construction projects include the Burj Dubai, which will include a 610- to 705-meter (m) tower that, when built, would become the world's tallest building, exceeding the Taipei 101 (509 m) in Taipei, Taiwan; the Petronas Towers (452 m) in Kuala Lumpur, Malaysia; and the Sears Tower (442 m) in Chicago, IL. The proposed projects also include the 4.2-million-square-meter Retail and Entertainment World in Dubai and the Dubai Mall, which was designed with 560,000 square meters (m^2) of gross leasable area compared with the West Edmonton Mall (490,000 m^2) in Edmonton, Alberta, Canada, and the Mall of America (390,000 m^2) in Bloomington, MN (Middle East Economic Digest, 2004e; Ministry of Information and Culture, 2004§; Chicago Public Library, 2005§; Emirates Network, The, 2005§).

Metals

Aluminum.—In June, construction of potline 7 began at the Dubai Aluminium Co. Ltd. (Dubal) aluminum smelter. The $204 million expansion project would add 120 pots and 75,000 metric tons per year (t/yr) of primary aluminum production

[1]Comprises the following emirates: Abu Dhabi, Ajman, Dubai, Fujairah, Ras Al-Khaimah, Sharjah, and Umm al-Qaywayn.
[2]Where necessary, values have been converted from United Arab Emirate dirham (Dh) to U.S. dollars (US$) at the rate of Dh3.67=US$1.00.
[3]References that include a section mark (§) are found in the Internet References Cited section.

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capacity to the Dubal smelter. Commercial production was expected to begin in late 2005. In November 2004, Dubal announced plans to expand its aluminum casting operations by mid-2005. The proposed casthouse expansion would bring finished-aluminum production capacity to a reported 850,000 t/yr (Dubai Aluminium Co. Ltd., 2004a, b).

Iron and Steel.—The construction boom in the Gulf region provided the impetus for several new projects that were announced in 2004. Because of the local demand for rebar, the state-owned General Holding Corp.'s Emirates Iron and Steel Factory increased production to about 600,000 t in 2004, which exceeded the plant's 500,000-t/yr design capacity. In 2003, the factory's output was 340,000 t (Middle-East-Steel.com, 2005§; Qadir, 2005§).

The Abu Dhabi Investment Co. proposed to build a 1.2-million-metric-ton-per-year (Mt/yr)-capacity sponge iron plant and a 1.18-Mt/yr steel plant in Fujairah. QASCO Dubai Steel FZE (an affiliate of Qatar Steel Co. of Qatar) awarded a contract to Morgan Construction Co. to upgrade its rod mill in Dubai. Qatar Steel had acquired the mill in the Jebel Ali Free Zone in August 2003. Also in Dubai, the newly formed United Stainless Co., which was owned by Gulf Industrial Investment Co. of Kuwait, National Industries Group of Kuwait, and local investors, proposed to build a $200 million stainless steel mill. The 90,000-t/yr cold-rolled stainless steel mill was expected to begin production in 2007. Union Iron and Steel LLC ordered a 300,000-t/yr-capacity mill, which would be installed in Abu Dhabi. Abu Dhabi Metals Pipes and Profiles Industries Complex LLC announced a planned $68 million expansion of its pipeline manufacturing facility in Mussafah, Abu Dhabi. The proposed 300,000-t/yr expansion would be producing large-diameter pipe by late 2005 (Steel Times International, 2004; Middle East Economic Digest, 2004d, f, g).

The iron and steel scrap sector was roiled after a $68 per ton tax was imposed on exports of iron and steel scrap in September. Gulf region scrap traditionally had been collected and consolidated in Dubai, then reexported to Asia (primarily China and India).

Industrial Minerals

Cement.—Cement prices in the UAE reached $6.80 per bag in June, after which increased imports resulted in the decline in the price per bag to below $4.00. Because of the high demand for cement in the UAE, several new cement projects were announced. Al-Ain Cement Co. proposed to close its Al-Ain, Abu Dhabi plant and open a 7,500- to 10,000-metric-ton-per-day (t/d) plant in Fujairah. In Ras Al-Khaimah, Union Cement Co. proposed to increase the output of its Koher Khwair Industrial area plant with the installation of a new 10,000-t/d clinker kiln, and Gulf Cement Co. proposed a 7,500-t/d expansion of its plant. Jebel Ali Cement Factory LLC awarded a contract for the construction of a 2,300-t/d cement plant in the Jebel Ali Industrial Area, Dubai. The Jebel Ali plant was expected to be in operation by early 2006 (Middle East Economic Digest, 2004b; ABQ Zawya Ltd., 2004§; Gulf News, 2004§; Khaleej Times, 2004§).

Mineral Fuels

Natural Gas.—Several natural gas projects underway in 2004 included the expansion of gas handling facilities at the Bu Hasa and the Habshan gas plants for the Abu Dhabi National Oil Co. (ADNOC) Group. With the completion of the Onshore Gas Development Project phase III and the Asab Gas Development Project phase II in 2008, the Group would increase natural gas processing capacity to more than 72 billion cubic meters per year from the current capacity of about 52 billion cubic meters per year. In January, Dolphin Energy Ltd. began to pipe natural gas to Fujairah from Oman (Middle East Economic Digest, 2004a).

Outlook

The Government continued its long-term diversification of the economy away from dependence on hydrocarbons. In 2004, the mining and quarrying sector (primarily hydrocarbons) accounted for about 29.2% of the GDP compared with that of 1990, when mining and quarrying accounted for 46% of the GDP. The Emirate of Abu Dhabi planned to establish five new industrial zones and an oilfield service company complex. Abu Dhabi also continued with its privatization of state-owned companies, which included the Emirates Cement Factory and the Emirates Iron and Steel Factory. Dubal's production and the availability of natural gas could attract downstream aluminum processors to Dubai (Central Bank of the United Arab Emirates, 2005, p. 18; Ministry of Information and Culture, 2005§).

The Gulf region construction boom has resulted from the development of the tourism industry in Abu Dhabi and Dubai, the reconstruction of Iraqi infrastructure, and regional growth. Demand for aggregates, cement, glass, and steel has outstripped domestic supply; several new factories and quarries, and plant expansions were proposed or underway. Development of the tourism industry in the northern Emirates could continue the demand for construction materials for years.

In the oil sector, ADNOC proposed to expand its crude oil production capacity to 3.7 million barrels per day by 2010 after national output approached about 2.5 million barrels per day in April. The UAE's proven oil reserves were estimated to be 97.8 million barrels, which ranked the country as the fifth in the world after Saudi Arabia, Iran, Iraq, and Kuwait. Any increased oil production would be subject to OPEC production ceiling allocations. Additional domestic and international investor attention in the natural gas and petrochemical sectors is expected (BP plc., 2005, p. 4).

References Cited

BP plc., 2005, BP Statistical review of world energy: London, United Kingdom, BP plc., 41 p.

Central Bank of the United Arab Emirates, 2005, Annual report—2004: Abu Dhabi, United Arab Emirates, Central Bank of the United Arab Emirates, 85 p.

Dubai Aluminium Co. Ltd., 2004a, Dubal to invest massive AED 110 million on second phase of casthouse expansions: Dubai, United Arab Emirates, Dubai Aluminium Co. Ltd. press release, November 10, 3 p.

Digitized by Google

Dubai Aluminium Co. Ltd., 2004b, Landmark ceremony for potline-7 expansion: Dubai, United Arab Emirates, Dubai Aluminium Co. Ltd. press release, June 12, 2 p.
Middle East Economic Digest, 2004a, ADNOC CEO sets out project plans: Middle East Economic Digest, v. 48, no. 40, October 1, p. 11.
Middle East Economic Digest, 2004b, Cement projects move ahead: Middle East Economic Digest, v. 48, no. 36, September 3, p. 17.
Middle East Economic Digest, 2004c, GCC rail plans rolls forward: Middle East Economic Digest, v. 48, no. 44, October 29, p. 15.
Middle East Economic Digest, 2004d, GIC moves ahead with steel plant: Middle East Economic Digest, v. 48, no. 22, May 28, p. 19.
Middle East Economic Digest, 2004e, Groups line up for Burj Dubai: Middle East Economic Digest, v. 48, no. 11, March 12, p. 15.
Middle East Economic Digest, 2004f, News in brief—Union to get new mill: Middle East Economic Digest, v. 48, no. 42, October 15, p. 22.
Middle East Economic Digest, 2004g, Tenders due for Adpico expansion: Middle East Economic Digest, v. 48, no. 43, October 22, p. 22.
Steel Times International, 2004, ADIC to build steel plant in Fujairah: Steel Times International, v. 28, no. 5, July/August, p. 3.
Thompson, Richard, 2004, The sky's the limit: Middle East Economic Digest, v. 48, no. 51, December 17, p. 31-36.

Internet References Cited

ABQ Zawya Ltd., 2004 (October 13), Gulf Cement to get $100m clinker line, accessed October 13, 2004, at URL http://www.zawya.com/Story.cfm?id=135697&Section=Industries&page=Construction&1=060007041013.
Chicago Public Library, 2005 (July), World's top 10 buildings, accessed October 14, 2005, at URL http://www.chipublib.org/0004chicago/timeline/searstower.html.
Dubai Metals & Commodities Centre, 2005, Gold statistics, accessed October 7, 2005, at URL http://www.dmcc.ae/GOLD_statistics.htm.
Emirates Network, The, 2005, Dubailand, accessed October 14, 2004, at URL http://guide.theemiratesnetwork.com/living/dubai/dubailand.php.
Gulf News, 2004 (November 30), Jebel Ali Cement Factory begins strategic expansion, accessed November 30, 2004, at URL http://www.gulf-news.com/Articles/Business2.asp?ArticleID=141730.
International Monetary Fund, 2005 (September), United Arab Emirates, World Economic Outlook Database, accessed September 30, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.
Khaleej Times, 2004 (December 13), UCC in Dh500m pact with Chinese firm, accessed December 14, 2004, at URL http://www.khaleejtimes.com/Displayarticle.asp?section=business&xfile=data/business/2004/december/business_december213.xml.
Middle-East-Steel.com, 2005 (February 12), Emirates Iron and Steel Factory doubled annual capacity, accessed March 3, 2005, at URL http://steelmillsoftheworld.com/news/newsdisplay.asp?slno=1857
Ministry of Information and Culture, 2004, Economic development, accessed October 12, 2005, at URL http://www.uaeinteract.com/uaeint_misc/pdf/English/Economic_Development.pdf.
Ministry of Information and Culture, 2005, Economic development, accessed October 12, 2005, at URL http://www.uaeinteract.com/uaeint_misc/pdf_2005/English_2005/eyb7.pdf.
Qadir, Jamila, UAE iron plant to double output, accessed March 30, 2005, at URL http://www.khaleejtimes.com/DisplayArticle.asp?xfile=data/business/2005/March/business_March595.xml&section=business.

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TABLE 1

THE UNITED ARAB EMIRATES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002[e]	2003[e]	2004[e]
Aluminum, primary[e]		470,000	500,000	536,000	560,000	683,000
Cement, hydraulic[e]		6,100,000	6,100,000	7,000,000 [r]	8,000,000 [r]	8,000,000
Chromium, gross weight[e]		30,000	10,000	-- [r]	-- [r]	7,089 [3]
Gas, natural:[e]						
Gross	million cubic meters	52,000	54,000	55,000	60,000	61,000
Dry	do.	39,800	41,300	42,000	45,000	46,000
Gypsum[e]		90,000	90,000	90,000	100,000	100,000
Lime[e]		50,000	50,000	50,000	50,000	50,000
Natural gas plant liquids[e]	thousand 42-gallon barrels	80,000	80,000	81,000 [r]	87,000 [r]	88,000
Nitrogen:						
N content of ammonia		348,400	357,900	364,000	421,000	380,400 [3]
N content of urea		243,400	250,000 [e]	260,000	400,000	350,000
Petroleum:[e]						
Crude	thousand 42-gallon barrels	815,000	790,000	750,000	920,000	970,000
Refinery products:[4]						
Gasoline	do.	10,800	11,000	11,400	11,000	12,000
Kerosene	do.	30,900	30,000	39,000	40,000	40,000
Distillate fuels	do.	29,100	30,000	34,900	33,800	36,000
Residual fuels	do.	13,400	12,000	11,300	7,800	13,000
Other	do.	30,800	30,000	58,300	38,400	59,000
Total	do.	115,000	113,000	155,000	131,000	160,000
Steel[e]		70,000	70,000	70,000	50,000	70,000
Sulfur, byproduct of petroleum refining and natural gas processing		1,122,000	1,490,000 [e]	1,900,000	1,900,000	1,900,000

[e]Estimated; estimated data and totals are rounded to no more than three significant digits and may not add to totals shown. [r]Revised. -- Negligible or no production.

[1]Table includes data available through October 7, 2005.

[2]In addition to the commodities listed, crude industrial minerals, such as common clays, diabase, gravel, limestone, marble, sand, and shale presumably are produced, but output is not reported, and information is inadequate to make estimates of output.

[3]Reported figure.

[4]Daily production data converted assuming a 365-day operating year, and rounded to no more than three significant digits; may not add to totals shown.

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THE MINERAL INDUSTRY OF YEMEN

By Philip M. Mobbs

The Republic of Yemen produced cement, crude petroleum, gypsum, limestone, marble, natural gas, refined petroleum products, salt, sand and gravel, and stone. The mining sector, which included oil and gas production, accounted for almost 14% of the gross domestic product (GDP) at constant prices. When current prices were used, the mining sector accounted for 31% of the GDP; construction, 6%; and oil refining, about 0.5%.

In 2004, the GDP at constant prices was estimated to have increased by 2.7% compared with a 3.1% increase in 2003 and a 3.9% increase in 2002. This gradual decline in the GDP's rate of increase was attributed to reduced oil production from aging oilfields. In 2004, the GDP based on purchasing power parity was estimated to be $18.3 billion[1] and per capita GDP based on purchasing power parity was estimated to be about $735. Income from the production and sale of crude oil and natural gas accounted for 72% of total Government revenue, which was significantly more than budgeted income because of the higher-than-expected international oil prices in 2004 (International Monetary Fund, 2005, p. 3-4; Central Bank of Yemen, 2005§[2]; International Monetary Fund, 2005§).

Commodity Review

Metals

Cobalt, Copper, Nickel, and Platinum.—In late 2003, the South African office of Bateman Engineering BV received 6-month exploration options on the Al-Humarah copper-nickel deposit and on various minerals in the Aden area.

Cantex Mine Development Corp. continued exploration on its Al Masna'a cobalt-copper-nickel-platinum project, which was located about 205 kilometers (km) north-northwest of Sana'a. An infill rock and soil sample program in 2004 supplemented data obtained from soil samples taken in 2003. The company also raised funds for future exploration and kept looking for a joint-venture partner for its projects in Yemen. Nearby armed conflict between the Government and dissidents resulted in the postponement of the planned drill program at Al Masna'a until 2005. Also in 2005, a drill program was scheduled on the Suwar prospect, which was located about 50 km north-northwest of Sana'a, and a rock and soil sampling program was expected to begin on the Wadi Qutabah prospect, which was located about 60 km northwest of Sana'a (Cantex Mine Development Corp., 2004).

Gold.—Cantex collected rock and soil samples on the Al Hariqah gold prospect, which was located about 130 km northwest of Sana'a. The Ministry of Oil and Minerals contracted out a gold project feasibility study in the Jabali area, and the Al-Thani Group of the United Arab Emirates held an exploration license on the Wadi Maaden gold prospect, which was located about 50 km west of Mukalla.

Steel.—Construction of a 120,000-metric-ton-per-year-capacity rolling mill at Hodaidah for Al-Rahabi Trading Group was expected to be completed in 2005. The mill would produce reinforcing bar (MESteel.com, 2005§).

Zinc.—ZincOx Resources plc of the United Kingdom continued its feasibility study of the Jabaili zinc deposit for its joint-venture partners Anglo American plc and Ansan Wikfs (Hadramaut) Ltd. ZincOx advanced its leach-to-chemical (LTC) process and, in 2004, re-evaluated Jabaili as an LTC project that would produce 99.9% zinc oxide. Jabaili originally had been proposed as a zinc-concentrate-for-export project (ZincOx Resources plc, 2005, p. 7).

Mineral Fuels

Natural Gas.—Because there was little gas-gathering infrastructure, most of the natural gas in Yemen was produced from gas caps associated with oilfields and was flared or reinjected for reservoir pressure maintenance. For a number of years, the gas production from fields on the Jannah and Marib al Jawf Blocks has been reinjected into the reservoirs in anticipation of the eventual development of a liquefied natural gas (LNG) plant. Yemen LNG Co. Ltd. (YLNG) was formed in 1997 to build and operate an LNG plant, but the company has been unable to finalize long-term gas-supply contracts with international buyers. Signed contracts would allow YLNG to seek funding for its proposed two-train 6.2-million-metric-ton-per-year-capacity plant. Construction of the plant was expected to take about 4 years. YLNG, which in 2004 was owned by Total S.A. of France (42.9%), state-owned Yemen Gas Co. (23.1%), Yemen Hunt LNG Co. (18%), SK Corp. of South Korea (10%), and Hyundai Corp. of South Korea (6%), continued to search for international natural gas buyers, especially in India and The Republic of Korea (Nichols and Avati, 2004).

As part of its Port Cities Development Program, the World Bank sought a contractor to perform a feasibility study of a 15- to 20-centimeter-diameter, 600-km natural gas pipeline from Marib to the ports of Aden and Hodaidah. Appropriate infrastructure would be needed to distribute natural gas to local industries and to a proposed 341-megawatt powerplant at Safir (Middle East Economic Digest, 2004c; Yemen Observer, 2005§).

Petroleum.—Companies that operated oilfields in Yemen for their partners included DNO ASA of Norway, Dove Energy Ltd. of the United Kingdom, Hunt Oil Co. of the United States, Nexen Inc. of Canada, Total S.A. of France, Vintage Petroleum, Inc. of the United States, and state-owned Yemen Investment Co. for Oil and Minerals. Exploration and production operations

[1]Where necessary, values have been converted from Yemeni rials (YR) to U.S. dollars (US$) at the average rate of YR185.8=US$1.00 for 2004 data.

[2]References that include a section mark (§) are found in the Internet References Cited section.

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on concessions in Yemen were based on negotiated production-sharing agreements between the Government and the joint-ventures partners. In 2004, new exploration blocks were awarded to DNO (Block 72), Dove (Block 73), and Sinopec International Petroleum Exploration and Production Corp., which was a subsidiary of China Petroleum & Chemical Corp. (Blocks 69 and 71).

Rehabilitation of the Aden refinery and expansion of the Marib topping plant were proposed. The original design capacity of the Aden refinery was 170,000 barrels per day (bbl/d), but it has produced at a significantly lower rate in recent years. In 2004, agreements were signed for the construction of a 40,000-bbl/d-capacity oil refinery near Mukalla for Hadramaut Refineries Co. Ltd. that would supply petroleum products to eastern Yemen by 2007 and a 30,000-bbl/d-capacity facility at Ras Issa for Hoodoil Ltd. that was expected to begin to supply western Yemen in 2006 (Middle East Economic Digest, 2004a, b; Petroleum Economist, 2004).

Reserves

Zinc resources at Jabali were calculated to be 12.6 million metric tons at a grade of 8.9% zinc. National natural gas reserves were estimated to be between 396 million and 479 million cubic meters. Estimates of oil reserves in Yemen ranged from 1.3 billion to more than 4 billion barrels (World Bank Group, 2004, p. 5; ZincOx Resources plc, 2005, p. 7; Ministry of Oil and Minerals, 2003§; U.S. Energy Information Administration, 2005§).

Outlook

The Government's economic diversification program would be helped by the development of metal deposits and additional industrial mineral deposits. The construction industry and the economy would benefit from the expected increased cement production when the construction of proposed cement plants and the expansion of existing plants are completed during the next 3 to 4 years.

Security of mineral industry employees in Yemen remains a concern. Kidnappings, while rare, are not unheard of. In 2004, Government troops continued to constrain armed dissident activity in the Saadah Province. The Government and nongovernmental organizations also continued to remove landmines from the countryside. During 2001-04, 5,427 people were killed by landmines in Yemen (Yemen Gateway, 2001§; Middle East North Africa Financial Network, Inc., 2003§; Ahmed Al-Haj, 2004§; Sabanews.net, 2005§).

During the recent past, the decline in Yemen's oil production has not adversely affected export revenues because of the surge in international oil prices during 2003 and 2004. With no new significant finds, oil resources could be commercially depleted within 5 to 20 years at recent average extraction rates. The decline in production from the older oilfields, however, was expected to be partially offset by new production. New output expected in 2005 would include crude oil from the Nabrajah Field on Block 43 of the joint venture of DNO, Oil Search Ltd. of Papua New Guinea, and Government-owned The Yemen Co., and expanded production from fields that began to produce in 2004, such as the An Nagyah field on the Damis (S-1) Block of Vintage Petroleum, TransGlobe Energy Corp. of Canada, and Yemen Oil Co.; and the Bashair Al Khair-A and Bashair Al Khair-B Fields on the East Al Hajr Block of Nexen and The Yemen Co. The increase of international oil prices to nearly $40 per barrel at yearend 2004 from about $30 per barrel in January 2004 could be expected to encourage international oil company management to fund additional exploration in the future; about 10 exploration and 120 development wells were planned in 2005 (International Monetary Fund, 2005; Nexen Inc., 2004§; Yemen Times, 2004§).

The high international oil prices were not entirely a positive development for the Government. Because of limited in-country refining capacity, Yemen imported some petroleum products (primarily diesel and fuel oil) at international prices and sold them in Yemen at highly subsidized prices. The Government attempted to reduce the resultant smuggling of the subsidized fuels to other countries in the region. Output from the proposed new oil refineries would offset some of the costs of the subsidization program, but the continuation of the subsidy program at current (2004) levels and further increases in the international price of crude oil and petroleum products could adversely affect the Government's budget in the future (World Bank Group, 2004).

References Cited

Cantex Mine Development Corp., 2004, Cantex Exploration update for Nevada and Yemen: Kelowna, British Columbia, Canada, Cantex Mine Development Corp. press release, September 28, 1 p.

International Monetary Fund, 2005, Republic of Yemen—2004 Article IV consultation—Staff report—Public information notice on the Executive Board discussion and statement by the Executive Director for the Republic of Yemen: Washington, DC, International Monetary Fund Country Report No. 05/111, 57 p.

Middle East Economic Digest, 2004a, Chicago Bridge signs up for Ras Issa refinery: Middle East Economic Digest, v. 48, no. 8, February 20, p. 12.

Middle East Economic Digest, 2004b, Koreans win Hadramout refinery EPC: Middle East Economic Digest, v. 48, no. 20, May 14, p. 15.

Middle East Economic Digest, 2004c, Prequals for gas pipeline: Middle East Economic Digest, v. 48, no. 29, July 16, p. 14.

Nichols, Tom, and Avati, Helen, 2004, Taking the lead: Petroleum Economist, v. 71, no. 11, November, p. 19-20.

Petroleum Economist, 2004, News in brief—Yemen: Petroleum Economist, v. 71, no. 8, August, p. 46.

World Bank Group, 2004, Yemen Economic Update: Sana'a, Yemen, World Bank Group, Fall, 16 p.

ZincOx Resources plc, 2005, Annual report—2004: Bagshot, Surrey, United Kingdom, ZincOx Resouces plc, 37 p.

Internet References Cited

Ahmed Al-Haj, 2004 (August 6), Yemeni military pounds rebel hideouts, accessed August 6, 2004, via URL http://story.news.yahoo.com.

Central Bank of Yemen, 2005, Annual report—2004—Statistical appendices, accessed July 9, 2005, at URL http://www.centralbank.gov.ye/annexe.pdf.

International Monetary Fund, 2005 (April), Yemen, World Economic Outlook Database, accessed May 3, 2005, via URL http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbginim.cfm.

MESteel.com, 2005 (January 2), Al Rahabi installing 120 kt rebar line in Hodeidah, accessed March 3, 2005, at URL http://www.steelmillsoftheworld.com.news.newsdosplay.asp?slno=1654.

Middle East North Africa Financial Network, Inc., 2003 (September 13), Tribesmen blow up major Yemen oil pipeline, accessed July 22, 2004, at URL

Digitized by Google

http://www.menafn.com/qn_news_story_s.asp?storyid=28802.
Ministry of Oil and Minerals, 2003, Minister's welcome message, accessed November 25, 2003, at URL http://www.pepa.com.ye/wejeeh.htm.
Nexen Inc., 2004, Yemen, accessed July 8, 2005, at URL http://www.nexeninc.com/files/presentations/Yemen1.pdf.
Sabanews.net, 2005 (March 18), Nine fields cleared from landmines, accessed July 11, 2005, at URL http://www.sabanews.net/view.php?scope=f6a19&dr=&ir=&id=89675.
U.S. Energy Information Administration, 2005 (June 29), World proved reserves of oil and natural gas—Most recent estimates, accessed July 12, 2005, at URL http://www.eia.doe.gov/emeu/international/reserves.html.
Yemen Gateway, 2001, Kidnapping of foreigners in Yemen, accessed July 13, 2005, at URL http://www.al-bab.com/yemen/data/kidnap.htm.
Yemen Observer, 2005 (March 13), Siemens and BNCO to implement new gas-generated electricity plant, accessed March 15, 2005, via URL http://www.zawya.com.
Yemen Times, 2004 (February 9), Yemen to implement ambitious investment program in oil exploration, accessed March 11, 2004, at URL http://www,gasandoil.com/gov/news/ntm40808.htm.

Major Source of Information

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TABLE 1
YEMEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004[e]
Cement	metric tons	1,406,000	1,493,000	1,561,000	1,541,000	1,546,300 [4]
Gypsum	do.	42,000	44,000	41,000	42,000	44,000
Marble	thousand square meters	99	101	99	100	100
Natural gas:[e]						
Gross[3]	million cubic meters	18,000	18,000	29,991 [4]	30,000	28,000
Flared and used	do.	900	900	956 [4]	1,000	1,000
Liquids	thousand 42-gallon barrels	2,400	2,400	2,400	2,400	2,400
Petroleum:						
Crude	do.	167,000	165,000	159,924	157,000	149,000
Refinery products:						
Liquefied petroleum gas	do.	670	910	1,100	1,100	1,100
Benzene	do.	6,500 [r]	7,100 [r]	7,200 [r]	7,400 [r]	7,400
Kerosene	do.	3,150	3,630	3,450	3,510	3,600
Distillate fuel oil	do.	10,000	12,500	13,800	14,100	14,100
Residual fuel oil	do.	4,920	9,320	6,770	6,910	7,000
Other[e]	do.	315	420	420	430	400
Total	do.	25,600 [r]	33,900 [r]	32,700 [r]	33,500 [r]	33,600
Salt	metric tons	95,000	95,000	125,000	116,000	120,000
Sand and gravel		607	607	612	624	630
Stone, quarried		2,480	2,486	2,288	2,333	2,400

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to toals shown. [r]Revised.
[1]Table includes data available through July 9, 2005.
In addition, feldspar and silica sand may have been produced and limestone for cement was produced, but available information is inadequate to make estimates of output levels.
[3]Most natural gas that was produced was stripped of hydrocarbon liquids and reinjected.
[4]Reported figure.

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